

FILE 'HOME' ENTERED AT 14:05:09 ON 04 NOV 2003

=> file caplus
COST IN U.S. DOLLARS

SINCE FILE	TOTAL
ENTRY	SESSION
0.63	0.63

FULL ESTIMATED COST

FILE 'CAPLUS' ENTERED AT 14:07:06 ON 04 NOV 2003
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FILE COVERS 1907 - 4 Nov 2003 VOL 139 ISS 19
FILE LAST UPDATED: 3 Nov 2003 (20031103/ED)

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=> file reg
COST IN U.S. DOLLARS

SINCE FILE	TOTAL
ENTRY	SESSION
0.42	1.05

FULL ESTIMATED COST

FILE 'REGISTRY' ENTERED AT 14:07:09 ON 04 NOV 2003
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STRUCTURE FILE UPDATES: 3 NOV 2003 HIGHEST RN 612478-18-9
DICTIONARY FILE UPDATES: 3 NOV 2003 HIGHEST RN 612478-18-9

TSCA INFORMATION NOW CURRENT THROUGH JULY 14, 2003

Please note that search-term pricing does apply when conducting SmartSELECT searches.

Crossover limits have been increased. See HELP CROSSOVER for details.

Experimental and calculated property data are now available. See HELP PROPERTIES for more information. See STNote 27, Searching Properties in the CAS Registry File, for complete details:
<http://www.cas.org/ONLINE/STN/STNOTES/stnotes27.pdf>

=> s 2/Sc and 3/O
961 2/SC
3391526 3/O
L1 54 2/SC AND 3/O

=> s 2/Y and 3/O

4775 2/Y
3391526 3/O
L2 1805 2/Y AND 3/O

=> s 2/Al and 3/O
15014 2/AL
3391526 3/O
L3 3972 2/AL AND 3/O

=> s 1 or 2 or 3
14105704 1
15966710 2
12591339 3
<-----User Break----->

SYSTEM LIMITS EXCEEDED - SEARCH ENDED

The search profile you entered was too complex or gave too many answers. Simplify or subdivide the query and try again. If you have exceeded the answer limit, enter DELETE HISTORY at an arrow prompt (=>) to remove all previous answers sets and begin at L1. Use the SAVE command to store any important profiles or answer sets before using DELETE HISTORY.

=>
=> s l1 or l2 or l3
L4 5761 L1 OR L2 OR L3

=> file caplus
COST IN U.S. DOLLARS

	SINCE FILE	TOTAL
	ENTRY	SESSION
FULL ESTIMATED COST	26.12	27.17

FILE 'CAPLUS' ENTERED AT 14:08:34 ON 04 NOV 2003
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FILE COVERS 1907 - 4 Nov 2003 VOL 139 ISS 19
FILE LAST UPDATED: 3 Nov 2003 (20031103/ED)

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=> s l4 and (fuel cell)
275838 L4
322449 FUEL
1708205 CELL
36093 FUEL CELL
(FUEL(W)CELL)
L5 2771 L4 AND (FUEL CELL)

=> 5 and stabilized

5 IS NOT A RECOGNIZED COMMAND

The previous command name entered was not recognized by the system.
For a list of commands available to you in the current file, enter
"HELP COMMANDS" at an arrow prompt (=>).

```
=> s l5 and stabilized
      139572 STABILIZED
L6      1448 L5 AND STABILIZED
```

```
=> file reg
COST IN U.S. DOLLARS          SINCE FILE      TOTAL
                               ENTRY      SESSION
FULL ESTIMATED COST          6.42      33.59
```

FILE 'REGISTRY' ENTERED AT 14:10:21 ON 04 NOV 2003
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STRUCTURE FILE UPDATES: 3 NOV 2003 HIGHEST RN 612478-18-9
DICTIONARY FILE UPDATES: 3 NOV 2003 HIGHEST RN 612478-18-9

TSCA INFORMATION NOW CURRENT THROUGH JULY 14, 2003

Please note that search-term pricing does apply when
conducting SmartSELECT searches.

Crossover limits have been increased. See HELP CROSSOVER for details.

Experimental and calculated property data are now available. See HELP
PROPERTIES for more information. See STNote 27, Searching Properties
in the CAS Registry File, for complete details:
<http://www.cas.org/ONLINE/STN/STNOTES/stnotes27.pdf>

```
=> s 1/Ce and 2/O
      38017 1/CE
      4287765 2/O
L7      1704 1/CE AND 2/O
```

```
=> s l1 and l3 and l7
L8      0 L1 AND L3 AND L7
```

```
=> s l1 or l3 or l7
L9      5724 L1 OR L3 OR L7
```

```
=> file caplus
COST IN U.S. DOLLARS          SINCE FILE      TOTAL
                               ENTRY      SESSION
FULL ESTIMATED COST          8.84      42.43
```

FILE 'CAPLUS' ENTERED AT 14:11:07 ON 04 NOV 2003
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FILE COVERS 1907 - 4 Nov 2003 VOL 139 ISS 19
FILE LAST UPDATED: 3 Nov 2003 (20031103/ED)

This file contains CAS Registry Numbers for easy and accurate substance identification.

=> s l9 and (fuel cell)

265528 L9
322449 FUEL
1708205 CELL
36093 FUEL CELL
(FUEL(W)CELL)

L10 1747 L9 AND (FUEL CELL)

=> s l10 and (zirconia (p) stabilized)

59944 ZIRCONIA
139572 STABILIZED
15047 ZIRCONIA (P) STABILIZED

L11 326 L10 AND (ZIRCONIA (P) STABILIZED)

=> s l11 and cermet

9075 CERMET

L12 40 L11 AND CERMET

=> d l12 1-40 ibib ab kwic

L12 ANSWER 1 OF 40 CAPLUS COPYRIGHT 2003 ACS on STN

ACCESSION NUMBER: 2003:401574 CAPLUS

DOCUMENT NUMBER: 139:137219

TITLE: Electrodeposition of ceramics and ceramic composites for **fuel cell** applications

AUTHOR(S): Zhitomirsky, I.; Petric, A.

CORPORATE SOURCE: Department of Materials Science and Engineering, McMaster University, Hamilton, ON, L8S 4L7, Can.

SOURCE: Surface Engineering: Coatings and Heat Treatments, Proceedings of the 1st ASM International Surface Engineering Congress and the 13th International Federation for Heat Treatment and Surface Engineering Congress, Columbus, OH, United States, Oct. 7-10, 2002 (2003), Meeting Date 2002, 646-651. Editor(s): Popoola, Oludele O. ASM International: Materials Park, Ohio.

CODEN: 69DYAM; ISBN: 0-87170-781-0

DOCUMENT TYPE: Conference

LANGUAGE: English

AB Cathodic electrodeposition techniques were developed and utilized for deposition of ceramic materials for application in solid oxide fuel cells (SOFCs). Ceramic coatings of .ltoreq.100 .mu.m thickness were prep'd. by electrophoretic deposition (EPD) or electrolytic deposition (ELD). Advanced bath compns. were developed for EPD of electrode and electrolyte materials such as yttria **stabilized zirconia** (YSZ), Ce1-xGdxO2-y (CGO) La0.8Sr0.2Ga0.875Mg0.125O3-x (LSGM), La0.8Sr0.2Co0.2Fe0.8O3-x (LSCF) and (La0.8Sr0.2)0.98MnO3-.vdelta. (LSM). The use of the common solvent-dispersant-binder system enabled EPD of consecutive layers of different materials. Electrolytic deposition has been utilized for deposition of thin layers of YSZ, CGO, LaCrO3, CaMnO3 and CeO2 for possible applications as **fuel cell** electrolytes, high temp. protective coatings or barrier layers for

prevention of electrode/electrolyte degrdn.

REFERENCE COUNT: 20 THERE ARE 20 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

- TI Electrodeposition of ceramics and ceramic composites for **fuel cell** applications
- AB Cathodic electrodeposition techniques were developed and utilized for deposition of ceramic materials for application in solid oxide fuel cells (SOFCs). Ceramic coatings of .1toeq.100 .mu.m thickness were prep'd. by electrophoretic deposition (EPD) or electrolytic deposition (ELD). Advanced bath compns. were developed for EPD of electrode and electrolyte materials such as yttria **stabilized zirconia** (YSZ), $\text{Ce}_{1-x}\text{Gd}_x\text{O}_{2-y}$ (CGO) $\text{La}_{0.8}\text{Sr}_{0.2}\text{Ga}_{0.875}\text{Mg}_{0.125}\text{O}_3-x$ (LSGM), $\text{La}_{0.8}\text{Sr}_{0.2}\text{Co}_{0.2}\text{Fe}_{0.8}\text{O}_{3-x}$ (LSCF) and $(\text{La}_{0.8}\text{Sr}_{0.2})_{0.98}\text{MnO}_3-\delta$ (LSM). The use of the common solvent-dispersant-binder system enabled EPD of consecutive layers of different materials. Electrolytic deposition has been utilized for deposition of thin layers of YSZ, CGO, LaCrO_3 , CaMnO_3 and CeO_2 for possible applications as **fuel cell** electrolytes, high temp. protective coatings or barrier layers for prevention of electrode/electrolyte degrdn.
- ST electrodeposition **fuel cell** coating ceria zirconia heat resistant; electrophoretic deposition **fuel cell** coating ceria zirconia heat resistant
- IT Cermets
(Ni-yttria **stabilized zirconia**; electrodeposition of ceramics and ceramic composites for **fuel cell** applications)
- IT Adhesion, physical
Ball milling
Ceramic coatings
Ceramic composites
Ceramics
Electrodeposition
Electrodes
Electrolytes
Electrophoretic deposition
Microstructure
Strength
(electrodeposition of ceramics and ceramic composites for **fuel cell** applications)
- IT Adsorption
(of polymers; electrodeposition of ceramics and ceramic composites for **fuel cell** applications)
- IT Fuel cells
(solid oxide; electrodeposition of ceramics and ceramic composites for **fuel cell** applications)
- IT Molding
(tape-casting, of **cermet** substrates; electrodeposition of ceramics and ceramic composites for **fuel cell** applications)
- IT 27360-07-2
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PROC (Process)
(binder; electrodeposition of ceramics and ceramic composites for **fuel cell** applications)
- IT 76688-72-7D, Emphos PS 21A, esters
RL: MOA (Modifier or additive use); USES (Uses)
(dispersant; electrodeposition of ceramics and ceramic composites for **fuel cell** applications)
- IT 9002-98-6, Polyethylenimine 26062-79-3, Poly(diallyldimethylammonium chloride)
RL: MOA (Modifier or additive use); USES (Uses)
(electrodeposition of ceramics and ceramic composites for **fuel cell** applications)
- IT 64-17-5, Ethanol, uses 67-63-0, Isopropanol, uses

RL: NUU (Other use, unclassified); USES (Uses)
(electrodeposition of ceramics and ceramic composites for **fuel cell** applications)

IT 1306-38-3P, Cerium oxide (CeO₂), preparation 12017-94-6P, Chromium lanthanum oxide (CrLaO₃) 55575-02-5DP, Cerium gadolinium oxide, oxygen-deficient 59707-46-9P, Lanthanum manganese strontium oxide 114168-16-0P, Yttrium zirconium oxide (Y_{0.16}Zr_{0.92}O_{2.08}) 148595-69-1DP, Cobalt iron lanthanum strontium oxide (Co_{0.2}Fe_{0.8}La_{0.8}Sr_{0.2}O₃), oxygen-deficient 239467-10-8DP, Gallium lanthanum magnesium strontium oxide (Ga_{0.88}La_{0.8}Mg_{0.12}Sr_{0.2}O₃), oxygen-deficient
RL: PRP (Properties); SPN (Synthetic preparation); PREP (Preparation)
(electrodeposition of ceramics and ceramic composites for **fuel cell** applications)

IT 7440-02-0, Nickel, processes
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PYP (Physical process); PROC (Process)
(foils, substrates; electrodeposition of ceramics and ceramic composites for **fuel cell** applications)

IT 12177-86-5P, Calcium manganese oxide (CaMnO₃)
RL: PRP (Properties); SPN (Synthetic preparation); PREP (Preparation)
(perovskite-structured; electrodeposition of ceramics and ceramic composites for **fuel cell** applications)

IT 65099-59-4, Calcium manganese oxide (Ca₂Mn₃O₈)
RL: FMU (Formation, unclassified); FORM (Formation, nonpreparative)
(phase; electrodeposition of ceramics and ceramic composites for **fuel cell** applications)

IT 7790-86-5, Cerium chloride (CeCl₃) 10025-84-0, Lanthanum chloride (LaCl₃) heptahydrate 10025-94-2, Yttrium chloride (YCl₃) hexahydrate 10060-12-5, Chromium chloride (CrCl₃) hexahydrate 13446-34-9, Manganese chloride (MnCl₂) tetrahydrate 13450-84-5, Gadolinium chloride (GdCl₃) hexahydrate 13477-34-4, Calcium nitrate (Ca(NO₃)₂) tetrahydrate 13520-92-8, Zirconium chloride oxide (ZrCl₂O) octahydrate
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PROC (Process)
(starting material; electrodeposition of ceramics and ceramic composites for **fuel cell** applications)

IT 147703-98-8
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PYP (Physical process); PROC (Process)
(substrate; electrodeposition of ceramics and ceramic composites for **fuel cell** applications)

L12 ANSWER 2 OF 40 CAPLUS COPYRIGHT 2003 ACS on STN

ACCESSION NUMBER: 2003:384503 CAPLUS

DOCUMENT NUMBER: 139:152232

TITLE: Novel SOFC anodes for the direct electrochemical oxidation of hydrocarbons

AUTHOR(S): Gorte, R. J.; Vohs, J. M.

CORPORATE SOURCE: Department of Chemical Engineering, University of Pennsylvania, Philadelphia, PA, 19104, USA

SOURCE: Journal of Catalysis (2003), 216(1-2), 477-486
CODEN: JCTLA5; ISSN: 0021-9517

PUBLISHER: Elsevier Science

DOCUMENT TYPE: Journal

LANGUAGE: English

AB Recent developments in solid-oxide fuel cells (SOFC) that electrochem. oxidize hydrocarbon fuels to produce elec. power without first reforming them to H₂ are described. First, the operating principles of SOFCs are reviewed, along with a description of state-of-the-art SOFC designs. This is followed by a discussion of the concepts and procedures used in the synthesis of direct-oxidn. fuel cells with anodes based on composites of Cu, ceria, and yttria-stabilized zirconia. The discussion focuses on how heterogeneous catalysis has an important role to play in the development of SOFCs that directly oxidize hydrocarbon fuels.

REFERENCE COUNT: 49 THERE ARE 49 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

AB Recent developments in solid-oxide fuel cells (SOFC) that electrochem. oxidize hydrocarbon fuels to produce elec. power without first reforming them to H₂ are described. First, the operating principles of SOFCs are reviewed, along with a description of state-of-the-art SOFC designs. This is followed by a discussion of the concepts and procedures used in the synthesis of direct-oxidn. fuel cells with anodes based on composites of Cu, ceria, and yttria-stabilized zirconia. The discussion focuses on how heterogeneous catalysis has an important role to play in the development of SOFCs that directly oxidize hydrocarbon fuels.

ST solid oxide **fuel cell** anode oxidn hydrocarbon; yttria **stabilized zirconia** copper **cermet** ceria **fuel cell** anode

IT Cermets
Fuel cell anodes
Oxidation, electrochemical
Solid state fuel cells
(anodes for direct electrochem. oxidn. of hydrocarbons in fuel cells)

IT 1306-38-3, Cerium oxide, uses 7440-50-8, Copper, uses 12031-12-8, Lanthanum manganese oxide (LaMnO₃) 64417-98-7, Yttrium zirconium oxide
RL: DEV (Device component use); USES (Uses)
(anodes for direct electrochem. oxidn. of hydrocarbons in fuel cells)

L12 ANSWER 3 OF 40 CAPLUS COPYRIGHT 2003 ACS on STN

ACCESSION NUMBER: 2002:836449 CAPLUS

DOCUMENT NUMBER: 138:173252

TITLE: Study on steam reforming of CH₄ and C₂ hydrocarbons and carbon deposition on Ni-YSZ cermets

AUTHOR(S): Takeguchi, Tatsuya; Kani, Yukimune; Yano, Tatsuya; Kikuchi, Ryuji; Eguchi, Koichi; Tsujimoto, Keigo; Uchida, Yoshitaka; Ueno, Akira; Omoshiki, Koiji; Aizawa, Masanobu

CORPORATE SOURCE: Department of Energy and Hydrocarbon Chemistry, Kyoto University, Graduate School of Engineering, Sakyo-ku, Kyoto, 606-8501, Japan

SOURCE: Journal of Power Sources (2002), 112(2), 588-595

CODEN: JPSODZ; ISSN: 0378-7753

PUBLISHER: Elsevier Science B.V.

DOCUMENT TYPE: Journal

LANGUAGE: English

AB Equil. partial pressure of oxygen and the boundary of carbon deposition region were calcd. in the C-H-O phase diagram at 400-1000.degree.. The open circuit voltage for the solid oxide **fuel cell** (SOFC) was directly connected to the calcd. partial pressure of oxygen at higher temps. These calcns. suggested that the development of the anode catalyst without carbon deposition was one of the most promising ways to achieve high efficiency in SOFC because the amt. of added water could be reduced. The characteristics of steam reforming of methane and carbon deposition on Ni-Y₂O₃-**stabilized zirconia** (Ni-YSZ) cermets anodes were examd. The effect of MgO, CaO, SrO and CeO₂ addn. to Ni-YSZ cermets on their catalytic activity and carbon deposition was studied. All cermets were calcined and then reduced with hydrogen prior to the reforming reaction. Although, the CaO addn. slightly deteriorated the electrochem. activity as anode, the CaO addn. was effective in suppressing carbon deposition and promoted steam reforming of CH₄.

REFERENCE COUNT: 23 THERE ARE 23 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

AB Equil. partial pressure of oxygen and the boundary of carbon deposition region were calcd. in the C-H-O phase diagram at 400-1000.degree.. The open circuit voltage for the solid oxide **fuel cell** (SOFC) was directly connected to the calcd. partial pressure of oxygen at higher temps. These calcns. suggested that the development of the anode

- catalyst without carbon deposition was one of the most promising ways to achieve high efficiency in SOFC because the amt. of added water could be reduced. The characteristics of steam reforming of methane and carbon deposition on Ni-Y2O3-**stabilized zirconia** (Ni-YSZ) cermet anodes were examd. The effect of MgO, CaO, SrO and CeO2 addn. to Ni-YSZ cermet on their catalytic activity and carbon deposition was studied. All cermet were calcined and then reduced with hydrogen prior to the reforming reaction. Although, the CaO addn. slightly deteriorated the electrochem. activity as anode, the CaO addn. was effective in suppressing carbon deposition and promoted steam reforming of CH4.
- ST steam reforming methane carbon deposition nickel YSZ anode **cermet**; ethane ethene steam reforming solid oxide **fuel cell** catalyst
- IT Electric current-potential relationship
Fuel cell anodes
 Steam reforming catalysts
 Water gas shift reaction
 (steam reforming of CH4 and C2 hydrocarbons and carbon deposition on Ni-YSZ cermet modified with Ce2O or alk. earth oxides)
- IT 1314-23-4, **Zirconia**, uses
 RL: CAT (Catalyst use); DEV (Device component use); TEM (Technical or engineered material use); USES (Uses)
 (Y2O3-**stabilized** composite, **cermet** composite with Ni, optionally with Mg, Ca, Sr and Ce addn.; steam reforming of CH4 and C2 hydrocarbons and carbon deposition on Ni-YSZ cermet modified with Ce2O or alk. earth oxides)
- IT 7440-02-0, Nickel, uses
 RL: CAT (Catalyst use); DEV (Device component use); TEM (Technical or engineered material use); USES (Uses)
 (composite with Y2O3- **stabilized zirconia cermet**, optionally with Mg, Ca, Sr and Ce addn.; steam reforming of CH4 and C2 hydrocarbons and carbon deposition on Ni-YSZ cermet modified with Ce2O or alk. earth oxides)
- IT 108916-21-8, Lanthanum strontium manganese oxide (La0.6Sr0.4MnO3)
 RL: DEV (Device component use); TEM (Technical or engineered material use); USES (Uses)
 (**fuel cell** cathode; steam reforming of CH4 and C2 hydrocarbons and carbon deposition on Ni-YSZ cermet modified with Ce2O or alk. earth oxides)
- IT 1305-78-8, Calcium oxide (CaO), uses 1306-38-3, Cerium oxide (CeO2), uses 1309-48-4, Magnesium oxide (MgO), uses 1314-11-0, Strontium oxide (SrO), uses
 RL: CAT (Catalyst use); DEV (Device component use); TEM (Technical or engineered material use); USES (Uses)
 (precursor for **cermet** composite with Ni and Y2O3-**stabilized zirconia**; steam reforming of CH4 and C2 hydrocarbons and carbon deposition on Ni-YSZ cermet modified with Ce2O or alk. earth oxides)
- IT 1314-36-9, Yttrium oxide (Y2O3), uses
 RL: CAT (Catalyst use); DEV (Device component use); TEM (Technical or engineered material use); USES (Uses)
 (**stabilized zirconia** composite, **cermet** composite with Ni, optionally with Mg, Ca, Sr and Ce addn.; steam reforming of CH4 and C2 hydrocarbons and carbon deposition on Ni-YSZ cermet modified with Ce2O or alk. earth oxides)

L12 ANSWER 4 OF 40 CAPLUS COPYRIGHT 2003 ACS on STN

ACCESSION NUMBER: 2002:662441 CAPLUS

DOCUMENT NUMBER: 138:173203

TITLE: An examination of lanthanide additives on the performance of Cu-YSZ **cermet** anodes

AUTHOR(S): McIntosh, Steven; Vohs, John M.; Gorte, Raymond J.

CORPORATE SOURCE: Department of Chemical Engineering, University of Pennsylvania, Philadelphia, PA, 19104, USA

SOURCE: Electrochimica Acta (2002), 47(22-23), 3815-3821
CODEN: ELCAAV; ISSN: 0013-4686
PUBLISHER: Elsevier Science Ltd.
DOCUMENT TYPE: Journal
LANGUAGE: English

AB The effect of various lanthanide additives on the performance of Cu-yttria-stabilized zirconia (YSZ) cermet anodes for solid-oxide fuel cells (SOFCs) was studied at 973 K for H₂ and the direct oxidn. of butane. In all cases, the lanthanide oxides were added to the SOFC by impregnation of a porous YSZ matrix with aq. solns. of the nitrate salts, followed by decompn. of nitrate ions by calcination. Ceria is significantly more effective in promoting SOFC performance compared with the other lanthanides, and the performance of the lanthanide additives followed the catalytic activity obsd. for butane oxidn. with 100 torr each of butane and O₂. Samaria doping of ceria led to a slight decrease in performance but also decreased the catalytic activity of ceria for butane oxidn. Membrane-reactor studies with propylene fed to Cu-molybdena-YSZ anodes at 723 K showed a high selectivity to acrolein, while Cu-ceria-YSZ anodes showed only total oxidn. products under these conditions, implying that the catalytic properties of the oxides must be important. The application of these results to improved SOFC for direct oxidn. of hydrocarbons is discussed.

REFERENCE COUNT: 20 THERE ARE 20 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

TI An examination of lanthanide additives on the performance of Cu-YSZ cermet anodes

AB The effect of various lanthanide additives on the performance of Cu-yttria-stabilized zirconia (YSZ) cermet anodes for solid-oxide fuel cells (SOFCs) was studied at 973 K for H₂ and the direct oxidn. of butane. In all cases, the lanthanide oxides were added to the SOFC by impregnation of a porous YSZ matrix with aq. solns. of the nitrate salts, followed by decompn. of nitrate ions by calcination. Ceria is significantly more effective in promoting SOFC performance compared with the other lanthanides, and the performance of the lanthanide additives followed the catalytic activity obsd. for butane oxidn. with 100 torr each of butane and O₂. Samaria doping of ceria led to a slight decrease in performance but also decreased the catalytic activity of ceria for butane oxidn. Membrane-reactor studies with propylene fed to Cu-molybdena-YSZ anodes at 723 K showed a high selectivity to acrolein, while Cu-ceria-YSZ anodes showed only total oxidn. products under these conditions, implying that the catalytic properties of the oxides must be important. The application of these results to improved SOFC for direct oxidn. of hydrocarbons is discussed.

ST solid oxide fuel cell copper yttria stabilized zirconia anode; copper lanthanide yttria stabilized zirconia cermet anode fuel cell

IT Cermet

Fuel cell anodes

(effect of lanthanide additives on performance of Cu-YSZ cermet anodes)

IT 497818-62-9 497818-68-5 497818-73-2 497818-79-8 497818-80-1
497818-82-3 497818-83-4 497818-86-7 497818-92-5 497818-93-6
497818-94-7

RL: CAT (Catalyst use); DEV (Device component use); USES (Uses)
(effect of lanthanide additives on performance of Cu-YSZ cermet anodes)

IT 1333-74-0, Hydrogen, uses

RL: TEM (Technical or engineered material use); USES (Uses)
(effect of lanthanide additives on performance of Cu-YSZ cermet anodes)

IT 106-97-8, Butane, uses 115-07-1, Propylene, uses

RL: TEM (Technical or engineered material use); USES (Uses)
(fuel; effect of lanthanide additives on performance of Cu-YSZ cermet anodes)

ACCESSION NUMBER: 2002:555812 CAPLUS

DOCUMENT NUMBER: 137:127530

TITLE: Nickel-ceramic composite (**cermet**) anode for sulfur-resistant solid oxide fuel cells combusting hydrocarbon and alcohol fuels

INVENTOR(S): Gorte, Raymond J.; Vohs, John M.

PATENT ASSIGNEE(S): Trustees of the University of Pennsylvania, USA

SOURCE: PCT Int. Appl., 57 pp.

CODEN: PIXXD2

DOCUMENT TYPE: Patent

LANGUAGE: English

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 2002058169	A2	20020725	WO 2001-US51149	20011109
WO 2002058169	A3	20030417		
W:	AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM			
RW:	GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW, AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR, BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG			
US 2003035989	A1	20030220	US 2001-53085	20011109
EP 1344271	A2	20030917	EP 2001-994519	20011109
R:	AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO, MK, CY, AL, TR			
PRIORITY APPLN. INFO.:			US 2000-247444P	P 20001109
			US 2001-269525P	P 20010219
			US 2001-308313P	P 20010727
			US 2001-289462P	P 20010508
			WO 2001-US51149	W 20011109

AB A solid oxide **fuel cell**, with inherent sulfur resistance for direct combustion of sulfur-contg. fuels (e.g., at 1-5000 ppm S content), consists of a anion-conductive solid electrolyte, a ceramic-metal composite (**cermet**) direct-oxidn. anode, and a cathode. The ceramic-metal (preferably nickel-yttria-stabilized zirconia ceramic) anode is fabricated by prepg. a nickel **cermet** contg. 10-60 wt.% Ni, leaching a portion of the nickel to impart a porosity, impregnating the porous nickel-**cermet** with a copper salt that is later calcined to CuO and then reduced to elemental copper. The resulting copper **cermet** or copper-nickel alloy **cermet** can be used as the direct-oxidn. anode. The anode can be fabricated as a multilayered cast ceramic tape and incorporated into the **fuel cell**. Anodes can be reactivated following sulfur deactivation by treating the anode with steam. Suitable fuels for use with the **fuel cell** include gasoline, diesel fuel, naphtha, jet fuel (JP-4, JP-5, and JP-8), kerosine, natural gas, fuel oil, MeOH, EtOH, methane, butane, toluene, and decane.

TI Nickel-ceramic composite (**cermet**) anode for sulfur-resistant solid oxide fuel cells combusting hydrocarbon and alcohol fuels

AB A solid oxide **fuel cell**, with inherent sulfur resistance for direct combustion of sulfur-contg. fuels (e.g., at 1-5000 ppm S content), consists of a anion-conductive solid electrolyte, a ceramic-metal composite (**cermet**) direct-oxidn. anode, and a cathode. The ceramic-metal (preferably nickel-yttria-stabilized zirconia ceramic) anode is fabricated by prepg. a nickel **cermet** contg. 10-60 wt.% Ni, leaching a portion of the nickel to

impart a porosity, impregnating the porous nickel-**cermet** with a copper salt that is later calcined to CuO and then reduced to elemental copper. The resulting copper **cermet** or copper-nickel alloy **cermet** can be used as the direct-oxidn. anode. The anode can be fabricated as a multilayered cast ceramic tape and incorporated into the **fuel cell**. Anodes can be reactivated following sulfur deactivation by treating the anode with steam. Suitable fuels for use with the **fuel cell** include gasoline, diesel fuel, naphtha, jet fuel (JP-4, JP-5, and JP-8), kerosine, natural gas, fuel oil, MeOH, EtOH, methane, butane, toluene, and decane.

- ST sulfur resistant **fuel cell** nickel **cermet**
anode; ceramic nickel anode sulfur resistant **fuel cell**
; tape casting ceramic nickel anode **fuel cell**
- IT **Fuel cell** anodes
(**cermets**; nickel-ceramic composite (**cermet**) anode for
sulfur-resistant solid oxide fuel cells combusting hydrocarbon and alc.
fuels)
- IT Diesel fuel
Jet aircraft fuel
(fuel, sulfur-contg.; nickel-ceramic composite (**cermet**) anode
for sulfur-resistant solid oxide fuel cells combusting hydrocarbon and
alc. fuels)
- IT Gasoline
Naphtha
Natural gas, miscellaneous
RL: MSC (Miscellaneous)
(fuel, sulfur-contg.; nickel-ceramic composite (**cermet**) anode
for sulfur-resistant solid oxide fuel cells combusting hydrocarbon and
alc. fuels)
- IT **Cermets**
Fuel cell cathodes
(nickel-ceramic composite (**cermet**) anode for sulfur-resistant
solid oxide fuel cells combusting hydrocarbon and alc. fuels)
- IT **Fuel cell** electrolytes
(solid electrolytes; nickel-ceramic composite (**cermet**) anode
for sulfur-resistant solid oxide fuel cells combusting hydrocarbon and
alc. fuels)
- IT **Fuel cells**
(solid-oxide; nickel-ceramic composite (**cermet**) anode for
sulfur-resistant solid oxide fuel cells combusting hydrocarbon and alc.
fuels)
- IT **Ceramics**
Molding of ceramics
(tapes; nickel-ceramic composite (**cermet**) anode for
sulfur-resistant solid oxide fuel cells combusting hydrocarbon and alc.
fuels)
- IT **Steam**
(treatment with, in reactivation of sulfur-deactivated **fuel**
cell anodes; nickel-ceramic composite (**cermet**) anode
for sulfur-resistant solid oxide fuel cells combusting hydrocarbon and
alc. fuels)
- IT 1345-13-7, Cerium oxide (Ce2O3). 7440-44-0, Carbon, uses
RL: DEV (Device component use); USES (Uses)
(**cermet** composite anodes contg.; nickel-ceramic composite (**cermet**)
cermet) anode for sulfur-resistant solid oxide fuel cells
combusting hydrocarbon and alc. fuels)
- IT 1313-99-1, Nickel oxide (NiO), uses
RL: DEV (Device component use); USES (Uses)
(**cermet** composites; nickel-ceramic composite (**cermet**
) anode for sulfur-resistant solid oxide fuel cells combusting
hydrocarbon and alc. fuels)
- IT 7440-19-9, Samarium, uses 7440-24-6, Strontium, uses 7440-54-2,
Gadolinium, uses
RL: DEV (Device component use); USES (Uses)

- (dopant, solid electrolyte contg.; nickel-ceramic composite (**cermet**) anode for sulfur-resistant solid oxide fuel cells combusting hydrocarbon and alc. fuels)
- IT 1306-38-3, Cerium dioxide, uses
RL: DEV (Device component use); USES (Uses)
(doped, solid electrolyte contg.; nickel-ceramic composite (**cermet**) anode for sulfur-resistant solid oxide fuel cells combusting hydrocarbon and alc. fuels)
- IT 12442-45-4, Cerium oxide sulfide (Ce2O2S)
RL: FMU (Formation, unclassified); RCT (Reactant); REM (Removal or disposal); FORM (Formation, nonpreparative); PROC (Process); RACT (Reactant or reagent)
(formation and removal of, from sulfur-deactivated anodes; nickel-ceramic composite (**cermet**) anode for sulfur-resistant solid oxide fuel cells combusting hydrocarbon and alc. fuels)
- IT 64-17-5, Ethanol, miscellaneous 67-56-1, Methanol, miscellaneous
74-82-8, Methane, miscellaneous 106-97-8, n-Butane, miscellaneous
108-88-3, Toluene, miscellaneous 124-18-5, Decane
RL: MSC (Miscellaneous)
(fuel, sulfur-contg.; nickel-ceramic composite (**cermet**) anode for sulfur-resistant solid oxide fuel cells combusting hydrocarbon and alc. fuels)
- IT 7782-42-5, Graphite, uses
RL: NUU (Other use, unclassified); USES (Uses)
(pore forming agent; nickel-ceramic composite (**cermet**) anode for sulfur-resistant solid oxide fuel cells combusting hydrocarbon and alc. fuels)
- IT 12160-53-1, Lanthanum gallium oxide (LaGaO3)
RL: DEV (Device component use); USES (Uses)
(solid electrolyte contg.; nickel-ceramic composite (**cermet**) anode for sulfur-resistant solid oxide fuel cells combusting hydrocarbon and alc. fuels)
- IT 12031-12-8, Lanthanum manganese oxide (LaMnO3)
RL: DEV (Device component use); USES (Uses)
(strontium-doped, solid electrolyte contg.; nickel-ceramic composite (**cermet**) anode for sulfur-resistant solid oxide fuel cells combusting hydrocarbon and alc. fuels)
- IT 1314-23-4, Zirconia, uses
RL: DEV (Device component use); USES (Uses)
(yttria-stabilized, **cermet** composites; nickel-ceramic composite (**cermet**) anode for sulfur-resistant solid oxide fuel cells combusting hydrocarbon and alc. fuels)
- IT 1314-36-9, Yttrium oxide (Y2O3), uses
RL: DEV (Device component use); USES (Uses)
(**zirconia stabilized** with, **cermet** composites; nickel-ceramic composite (**cermet**) anode for sulfur-resistant solid oxide fuel cells combusting hydrocarbon and alc. fuels)

L12 ANSWER 6 OF 40 CAPLUS COPYRIGHT 2003 ACS on STN

ACCESSION NUMBER: 2002:315391 CAPLUS

DOCUMENT NUMBER: 136:328203

TITLE: Solid oxide **fuel cell** having a supported electrolyte film

INVENTOR(S): Ukai, Kenji; Mizutani, Yasunobu

PATENT ASSIGNEE(S): Toho Gas Co. Ltd., Japan

SOURCE: U.S. Pat. Appl. Publ., 11 pp.

CODEN: USXXCO

DOCUMENT TYPE: Patent

LANGUAGE: English

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

PATENT NO.

KIND DATE

APPLICATION NO. DATE

US 2002048701	A1	20020425	US 2001-983056	20011023
JP 2002134131	A2	20020510	JP 2000-322671	20001023
EP 1202369	A1	20020502	EP 2001-125146	20011023

R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT,
IE, SI, LT, LV, FI, RO, MK, CY, AL, TR

PRIORITY APPLN. INFO.: JP 2000-322671 A 20001023

AB The present invention intends to provide a solid oxide **fuel cell** having a supported electrolyte film, which shows sufficiently high reliability, yields a high output, and exhibits high output power d. per unit vol. The present invention is characterized by use of a first **cermet** comprising catalyst and a second solid electrolyte, which has a bending strength of more than 500 MPa and exhibits oxide ion cond., for a fuel electrode substrate in an SOFC having a supported electrolyte film equipped with an electrolyte-electrode assembly that is made by bonding the fuel electrode substrate and an air electrode on both sides of an electrolyte film consisting of the first solid electrolyte capable of exhibiting oxide ion cond. As a preferred embodiment, **stabilized zirconia** contg. 2 to 4 mol% yttria or 3 to 6 mol% scandia is preferred for the second solid electrolyte. More particularly, an interlayer comprising the second catalyst and the third solid electrolyte, which shows oxide ion cond. of more than 0.1 S/cm at 800.degree., is preferably interposed between the electrolyte film and the fuel electrode substrate.

TI Solid oxide **fuel cell** having a supported electrolyte film

AB The present invention intends to provide a solid oxide **fuel cell** having a supported electrolyte film, which shows sufficiently high reliability, yields a high output, and exhibits high output power d. per unit vol. The present invention is characterized by use of a first **cermet** comprising catalyst and a second solid electrolyte, which has a bending strength of more than 500 MPa and exhibits oxide ion cond., for a fuel electrode substrate in an SOFC having a supported electrolyte film equipped with an electrolyte-electrode assembly that is made by bonding the fuel electrode substrate and an air electrode on both sides of an electrolyte film consisting of the first solid electrolyte capable of exhibiting oxide ion cond. As a preferred embodiment, **stabilized zirconia** contg. 2 to 4 mol% yttria or 3 to 6 mol% scandia is preferred for the second solid electrolyte. More particularly, an interlayer comprising the second catalyst and the third solid electrolyte, which shows oxide ion cond. of more than 0.1 S/cm at 800.degree., is preferably interposed between the electrolyte film and the fuel electrode substrate.

ST **fuel cell** supported electrolyte film

IT Fuel cells
(power plants; solid oxide **fuel cell** having supported electrolyte film)

IT Automobiles
Cermets
Fuel cell electrolytes
Solid state fuel cells
(solid oxide **fuel cell** having supported electrolyte film)

IT 108916-22-9, Lanthanum manganese strontium oxide La_{0.8}MnSr_{0.2}O₃
112721-99-0 113482-02-3, Tz-3y 114168-16-0, Tz-8y 157979-54-9,
Scandium zirconium oxide Sc_{0.22}Zr_{0.89}O_{2.11} 413584-20-0, Yttrium
zirconium oxide (Y_{0.04}-0.08Zr_{0.96}-0.98O_{2.02-2.04}) 413584-24-4, Scandium
zirconium oxide (Sc_{0.18}-0.24Zr_{0.88}-0.91O_{2.09-2.12}) 413584-27-7, Scandium
zirconium oxide (Sc_{0.06}-0.12Zr_{0.94}-0.97O_{2.03-2.06})

RL: DEV (Device component use); USES (Uses)
(solid oxide **fuel cell** having supported electrolyte film)

IT 1344-28-1, Alumina, uses
RL: MOA (Modifier or additive use); USES (Uses)

(solid oxide **fuel cell** having supported electrolyte film)

L12 ANSWER 7 OF 40 CAPLUS COPYRIGHT 2003 ACS on STN

ACCESSION NUMBER: 2001:841657 CAPLUS

DOCUMENT NUMBER: 136:186551

TITLE: Development of anodes for direct oxidation of hydrocarbon fuels

AUTHOR(S): Gorte, R. J.; Kim, H.; Vohs, J. M.

CORPORATE SOURCE: Dep. Chem. Eng., Univ. Pennsylvania, Philadelphia, PA, 19104, USA

SOURCE: Preprints of Symposia - American Chemical Society, Division of Fuel Chemistry (2001), 46(2), 678-679
CODEN: PSADPZ; ISSN: 1521-4648

PUBLISHER: American Chemical Society, Division of Fuel Chemistry

DOCUMENT TYPE: Journal

LANGUAGE: English

AB Direct electrochem. oxidn. of a wide variety of hydrocarbon fuels was evaluated in a direct-oxidn. solid oxide **fuel cell** with YSZ (yttria-**stabilized zirconia**) as the electrolyte and Cu-YSZ cermets as the **fuel cell** anode. Strontium-doped LaMnO₃ was used as the cell cathode. Addn. of a second metal oxide catalyst can enhance and modify the activities of the anode catalysts (e.g., for propylene oxidn., addn. of ceria promotes oxidn. to CO₂, whereas addn. of molybdena favored oxidn. to acrolein). Open-circuit voltages of 0.9-1.1 V were routinely obsd. for fuel cells combusting butane, decane, toluene, and synthetic diesel fuel, with good cell performance stability. Significant improvements in the performance can be expected when fuel cells are synthesized with thinner electrolytes, with improved anode structures, and with enhanced anode oxidn. activities.

REFERENCE COUNT: 9 THERE ARE 9 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

AB Direct electrochem. oxidn. of a wide variety of hydrocarbon fuels was evaluated in a direct-oxidn. solid oxide **fuel cell** with YSZ (yttria-**stabilized zirconia**) as the electrolyte and Cu-YSZ cermets as the **fuel cell** anode. Strontium-doped LaMnO₃ was used as the cell cathode. Addn. of a second metal oxide catalyst can enhance and modify the activities of the anode catalysts (e.g., for propylene oxidn., addn. of ceria promotes oxidn. to CO₂, whereas addn. of molybdena favored oxidn. to acrolein). Open-circuit voltages of 0.9-1.1 V were routinely obsd. for fuel cells combusting butane, decane, toluene, and synthetic diesel fuel, with good cell performance stability. Significant improvements in the performance can be expected when fuel cells are synthesized with thinner electrolytes, with improved anode structures, and with enhanced anode oxidn. activities.

ST **fuel cell** cathode copper **cermet**; hydrocarbon combustion **fuel cell** cathode copper **cermet**; yttria **stabilized zirconia** copper **cermet** **fuel cell** anode

IT Cermets

Combustion catalysts

(copper-YSZ cermets as **fuel cell** anodes for direct oxidn. of hydrocarbon fuels)

IT Diesel fuel

(oxidn. and combustion of, in fuel cells; copper-YSZ cermets as **fuel cell** anodes for direct oxidn. of hydrocarbon fuels)

IT **Fuel cell** anodes

(solid-oxide; copper-YSZ cermets as **fuel cell** anodes for direct oxidn. of hydrocarbon fuels)

IT 1306-38-3, Cerium oxide (CeO₂), uses 1313-27-5, Molybdena, uses

RL: CAT (Catalyst use); DEV (Device component use); USES (Uses)

(anodes contg.; copper-YSZ cermets as **fuel cell** anodes for direct oxidn. of hydrocarbon fuels)

- IT 12031-12-8, Lanthanum manganese oxide (LaMnO₃)
 RL: DEV (Device component use); USES (Uses)
 (cathodes; copper-YSZ cermets as **fuel cell** anodes
 for direct oxidn. of hydrocarbon fuels)
- IT 64417-98-7, Yttrium zirconium oxide
 RL: CAT (Catalyst use); DEV (Device component use); USES (Uses)
 (composites, **cermet** anodes and solid electrolytes; copper-YSZ
 cermets as **fuel cell** anodes for direct oxidn. of
 hydrocarbon fuels)
- IT 7440-50-8, Copper, uses
 RL: CAT (Catalyst use); DEV (Device component use); USES (Uses)
 (composites, **cermet** anodes; copper-YSZ cermets as
fuel cell anodes for direct oxidn. of hydrocarbon
 fuels)
- IT 107-02-8, Acrolein, formation (nonpreparative)
 RL: FMU (Formation, unclassified); FORM (Formation, nonpreparative)
 (formation of, in **fuel cell** combustion; copper-YSZ
 cermets as **fuel cell** anodes for direct oxidn. of
 hydrocarbon fuels)
- IT 106-97-8, Butane, reactions 108-88-3, Toluene, reactions 115-07-1,
 Propylene, reactions 124-18-5, n-Decane
 RL: CPS (Chemical process); PEP (Physical, engineering or chemical
 process); RCT (Reactant); PROC (Process); RACT (Reactant or reagent)
 (oxidn. and combustion of, in fuel cells; copper-YSZ cermets as
fuel cell anodes for direct oxidn. of hydrocarbon
 fuels)
- IT 1314-23-4, Zirconia, uses
 RL: CAT (Catalyst use); DEV (Device component use); USES (Uses)
 (yttria-stabilized, composites; copper-YSZ cermets as
fuel cell anodes for direct oxidn. of hydrocarbon
 fuels)

L12 ANSWER 8 OF 40 CAPLUS COPYRIGHT 2003 ACS on STN

ACCESSION NUMBER: 2001:819790 CAPLUS

DOCUMENT NUMBER: 136:234579

TITLE: Noble metal alloy-Zr(Sc)O₂ **cermet** cathode
 for reduced-temperature SOFCs

AUTHOR(S): Sasaki, K.; Tamura, J.; Dokiya, M.

CORPORATE SOURCE: Tanaka Kikinzoku Kogyo K.K., Kanagawa, Atsugi,
 243-0213, Japan

SOURCE: Solid State Ionics (2001), 144(3,4), 233-240

CODEN: SSIOD3; ISSN: 0167-2738

PUBLISHER: Elsevier Science B.V.

DOCUMENT TYPE: Journal

LANGUAGE: English

AB Polarization characteristics of noble metal alloy-(Sc_{0.10}Ce_{0.01})Zr_{0.89}O₂
 (SSZ) **cermet** cathodes were studied in order to develop a new
 cathode for reduced-temp. solid oxide fuel cells (SOFCs). Several noble
 metal alloy-SSZ **cermet** cathodes were prepd. by mixing Pt, Pd, Rh
 and/or Ag and their alloy powders with SSZ powder by using a high-energy
 ball mill in vacuum and pasting the **cermet** onto yttria
 stabilized zirconia (YSZ) electrolyte. A Pt-Ag/SSZ
cermet cathode achieved as high as 12 S/cm² of interfacial cond.,
 .sigma.E, at 973 K and 1.5 S/cm² at 873 K in air. This Pt-Ag/SSZ
cermet cathode has enough activity not only at 973 K but also at
 873 K, the high activity can be obtained by selecting a suitable alloy
 compn., ball milling a proper ratio of SSZ/noble metal mixt. in vacuum and
 controlling the cathode thickness and the sintering temp. By replacing
 the metallic component of **cermet** from Pt to Pt-Ag alloy (50 wt.%
 Pt), the quantity of Pt in **cermet** can be reduced to 19 from 40
 mg/cm² in addn. to the improvement of activity from 6.7 S/cm² at 973 K to
 12 S/cm² of .sigma.E at 973 K. The activation energies, Ea, of Pt-Ag and
 Pd-Ag/SSZ **cermet** were smaller than that of Pt/SSZ **cermet**
 . In the case of Pt-Ag/SSZ **cermet**, the Ea decreased with

increasing Ag ratio in the Pt-Ag alloy. The Ea also depends on the SSZ/Pt-Ag ratio. This cathode showed two optima of σ vs. the SSZ/Pt-Ag ratio and a remarkable dependence on cathode thickness. The first optimum is based on two-dimensional reaction sites on YSZ electrolyte and the second optimum originates from three-dimensional expansion of reaction sites into the **cermet** cathode layer.

REFERENCE COUNT: 24 THERE ARE 24 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

- TI Noble metal alloy-Zr(Sc)O₂ **cermet** cathode for reduced-temperature SOFCs
- AB Polarization characteristics of noble metal alloy-(Sc_{0.10}Ce_{0.01})Zr_{0.89}O₂ (SSZ) **cermet** cathodes were studied in order to develop a new cathode for reduced-temp. solid oxide fuel cells (SOFCs). Several noble metal alloy-SSZ **cermet** cathodes were prepd. by mixing Pt, Pd, Rh and/or Ag and their alloy powders with SSZ powder by using a high-energy ball mill in vacuum and pasting the **cermet** onto yttria stabilized zirconia (YSZ) electrolyte. A Pt-Ag/SSZ **cermet** cathode achieved as high as 12 S/cm² of interfacial cond., σ , at 973 K and 1.5 S/cm² at 873 K in air. This Pt-Ag/SSZ **cermet** cathode has enough activity not only at 973 K but also at 873 K, the high activity can be obtained by selecting a suitable alloy compn., ball milling a proper ratio of SSZ/noble metal mixt. in vacuum and controlling the cathode thickness and the sintering temp. By replacing the metallic component of **cermet** from Pt to Pt-Ag alloy (50 wt.% Pt), the quantity of Pt in **cermet** can be reduced to 19 from 40 mg/cm² in addn. to the improvement of activity from 6.7 S/cm² at 973 K to 12 S/cm² of σ at 973 K. The activation energies, Ea, of Pt-Ag and Pd-Ag/SSZ **cermet** were smaller than that of Pt/SSZ **cermet**. In the case of Pt-Ag/SSZ **cermet**, the Ea decreased with increasing Ag ratio in the Pt-Ag alloy. The Ea also depends on the SSZ/Pt-Ag ratio. This cathode showed two optima of σ vs. the SSZ/Pt-Ag ratio and a remarkable dependence on cathode thickness. The first optimum is based on two-dimensional reaction sites on YSZ electrolyte and the second optimum originates from three-dimensional expansion of reaction sites into the **cermet** cathode layer.
- ST **fuel cell** cathode oxide alloy **cermet**
- IT **Fuel cell** cathodes
(noble metal alloy-Zr(Sc)O₂ **cermet** cathode for reduced-temp. SOFCs)
- IT Solid state fuel cells
(oxide; noble metal alloy-Zr(Sc)O₂ **cermet** cathode for reduced-temp. SOFCs)
- IT 12677-39-3 39309-13-2 54741-94-5 94949-98-1 101995-78-2
105682-73-3 156994-66-0 **403647-64-3**, Cerium scandium zirconium oxide (Ce_{0.01}Sc_{0.1}Zr_{0.89}O₂) 403647-65-4
RL: PEP (Physical, engineering or chemical process); PRP (Properties); PROC (Process)
(noble metal alloy-Zr(Sc)O₂ **cermet** cathode for reduced-temp. SOFCs)

L12 ANSWER 9 OF 40 CAPLUS COPYRIGHT 2003 ACS on STN

ACCESSION NUMBER: 2001:819788 CAPLUS

DOCUMENT NUMBER: 136:234578

TITLE: Pt-**cermet** cathode for reduced temperature SOFCs

AUTHOR(S): Sasaki, K.; Tamura, J.; Dokiya, M.

CORPORATE SOURCE: Tanaka Kikinzo Kogyo K.K., Atsugi, Kanagawa, 243-0213, Japan

SOURCE: Solid State Ionics (2001), 144(3,4), 223-232

CODEN: SSIOD3; ISSN: 0167-2738

PUBLISHER: Elsevier Science B.V.

DOCUMENT TYPE: Journal

LANGUAGE: English

AB Polarization characteristics of Pt-(Sc_{0.10}Ce_{0.01})Zr_{0.89}O₂ (SSZ)

cermet cathodes were studied in order to develop new cathodes for reduced temp. solid oxide fuel cells (SOFCs). Several Pt-SSZ **cermet** electrodes were prep'd. by mixing Pt and SSZ powders by using a high-energy ball mill. A Pt-SSZ **cermet** cathode on yttria-stabilized zirconia (YSZ) electrolyte achieved high cathodic activity; the cathode interfacial cond. reached as high as 6.7 S/cm² at 973 K and 0.8 S/cm² at 873 K. These results suggest that this Pt-SSZ **cermet** cathode has enough capability at 973 K, but is still not satisfactory at 873 K. This high activity can be obtained by ball milling SSZ/Pt mixt. of proper ratios in vacuum and by controlling electrode thickness, sintering temp., and Ca impurity. These electrodes showed two optima of interfacial cond. vs. SSZ/Pt ratio and remarkable dependence on cathode thickness. The first optimum is based on two-dimensional reaction sites on YSZ electrolyte surface and the second one originates from three-dimensional expansion of reaction sites into the **cermet** cathode.

REFERENCE COUNT: 21 THERE ARE 21 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

TI Pt-**cermet** cathode for reduced temperature SOFCs
 AB Polarization characteristics of Pt-(Sc_{0.10}Ce_{0.01})Zr_{0.89}O₂ (SSZ) **cermet** cathodes were studied in order to develop new cathodes for reduced temp. solid oxide fuel cells (SOFCs). Several Pt-SSZ **cermet** electrodes were prep'd. by mixing Pt and SSZ powders by using a high-energy ball mill. A Pt-SSZ **cermet** cathode on yttria-stabilized zirconia (YSZ) electrolyte achieved high cathodic activity; the cathode interfacial cond. reached as high as 6.7 S/cm² at 973 K and 0.8 S/cm² at 873 K. These results suggest that this Pt-SSZ **cermet** cathode has enough capability at 973 K, but is still not satisfactory at 873 K. This high activity can be obtained by ball milling SSZ/Pt mixt. of proper ratios in vacuum and by controlling electrode thickness, sintering temp., and Ca impurity. These electrodes showed two optima of interfacial cond. vs. SSZ/Pt ratio and remarkable dependence on cathode thickness. The first optimum is based on two-dimensional reaction sites on YSZ electrolyte surface and the second one originates from three-dimensional expansion of reaction sites into the **cermet** cathode.
 ST **fuel cell** cathode platinum cerium scandium zirconium oxide
 IT **Fuel cell** cathodes
 (Pt-**cermet** cathode for reduced temp. SOFCs)
 IT Solid state fuel cells
 (oxide; Pt-**cermet** cathode for reduced temp. SOFCs)
 IT 7440-06-4, Platinum, processes 403647-64-3, Cerium scandium zirconium oxide (Ce_{0.01}Sc_{0.1}Zr_{0.89}O₂)
 RL: PEP (Physical, engineering or chemical process); PRP (Properties); PROC (Process)
 (Pt-**cermet** cathode for reduced temp. SOFCs)

L12 ANSWER 10 OF 40 CAPLUS COPYRIGHT 2003 ACS on STN
 ACCESSION NUMBER: 2001:101462 CAPLUS
 DOCUMENT NUMBER: 134:134143
 TITLE: Structures and fabrication techniques for solid state electrochemical devices
 INVENTOR(S): Visco, Steven J.; Jacobson, Craig P.; Dejonghe, Lutgard C.
 PATENT ASSIGNEE(S): The Regents of the University of California, USA
 SOURCE: PCT Int. Appl., 45 pp.
 CODEN: PIXXD2
 DOCUMENT TYPE: Patent
 LANGUAGE: English
 FAMILY ACC. NUM. COUNT: 2
 PATENT INFORMATION:

PATENT NO. KIND DATE APPLICATION NO. DATE

WO 2001009968 A1 20010208 WO 2000-US20889 20000728
W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BZ, CA, CH, CN, CR,
CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU,
ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU,
LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD,
SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU,
ZA, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM
RW: GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW, AT, BE, CH, CY,
DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, BF, BJ,
CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG

US 6605316 B1 20030812 US 2000-626629 20000727

EP 1228546 A1 20020807 EP 2000-953766 20000728

R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT,
IE, SI, LT, LV, FI, RO, MK, CY, AL

US 2003059668 A1 20030327 US 2002-273812 20021017

PRIORITY APPLN. INFO.:

US 1999-146769P P 19990731

US 2000-626629 A 20000727

WO 2000-US20889 W 20000728

AB Provided are low-cost, mech. strong, highly electronically conductive porous substrates and assocd. structures for solid-state electrochem. devices, techniques for forming these structures, and devices incorporating the structures. The invention provides solid state electrochem. device substrates of novel compn. and techniques for forming thin electrode/membrane/electrolyte coatings on the novel or more conventional substrates. In particular, in one embodiment the invention provides techniques for co-firing of device substrate (often an electrode) with an electrolyte or membrane layer to form densified electrolyte/membrane films 5 to 20 .mu.m thick. In another embodiment, densified electrolyte/membrane films 5 to 20 .mu.m thick may be formed on a pre-sintered substrate by a constrained sintering process. In some cases, the substrate may be a porous metal, alloy, or non-nickel **cermet** incorporating one or more of the transition metals Cr, Fe, Cu and Ag, or alloys thereof.

REFERENCE COUNT: 3 THERE ARE 3 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

AB Provided are low-cost, mech. strong, highly electronically conductive porous substrates and assocd. structures for solid-state electrochem. devices, techniques for forming these structures, and devices incorporating the structures. The invention provides solid state electrochem. device substrates of novel compn. and techniques for forming thin electrode/membrane/electrolyte coatings on the novel or more conventional substrates. In particular, in one embodiment the invention provides techniques for co-firing of device substrate (often an electrode) with an electrolyte or membrane layer to form densified electrolyte/membrane films 5 to 20 .mu.m thick. In another embodiment, densified electrolyte/membrane films 5 to 20 .mu.m thick may be formed on a pre-sintered substrate by a constrained sintering process. In some cases, the substrate may be a porous metal, alloy, or non-nickel **cermet** incorporating one or more of the transition metals Cr, Fe, Cu and Ag, or alloys thereof.

ST electrochem device solid state; **fuel cell** solid state

IT **1344-28-1**, Alumina, uses 7439-89-6, Iron, uses 7440-02-0, Nickel, uses 7440-22-4, Silver, uses 7440-47-3, Chromium, uses 7440-50-8, Copper, uses 11078-74-3, Bismuth yttrium oxide (Bi3YO6) 12606-02-9, Inconel 600 59989-70-7D, Cobalt samarium strontium oxide CoSm0.5Sr0.5O3, oxygen-deficient 64417-98-7, Yttrium zirconium oxide 106830-29-9, Yttrium zirconium oxide Y0.2Zr0.9O2.1 108916-22-9D, Lanthanum manganese strontium oxide La0.8MnSr0.2O3, oxygen-deficient 111569-09-6, Scandium zirconium oxide 114168-16-0, Tz-8y 116036-94-3D, Iron lanthanum nickel oxide Fe0.4LaNi0.6O3, oxygen-deficient 141588-91-2D, Lanthanum manganese strontium oxide La0.45MnSr0.55O3, oxygen-deficient 157975-55-8D, Lanthanum manganese strontium oxide La0.65MnSr0.3O3, oxygen-deficient 181530-05-2D, Cobalt iron lanthanum

strontium oxide $\text{Co}_{0.6}\text{Fe}_{0.4}\text{La}_{0.6}\text{Sr}_{0.4}\text{O}_3$, oxygen-deficient 197160-34-2, Cerium gadolinium oxide $\text{Ce}_{0.8}\text{Gd}_{0.4}\text{O}_{2.2}$ 235428-75-8D, Cerium manganese strontium oxide $\text{Ce}_{0.3}\text{MnSr}_{0.7}\text{O}_3$, oxygen-deficient 252913-17-0, Gallium lanthanum magnesium strontium oxide $\text{Ga}_{0.85}\text{La}_{0.8}\text{Mg}_{0.15}\text{Sr}_{0.2}\text{O}_{2.8}$ 321909-12-0D, Lanthanum manganese strontium oxide ($\text{La}_{0.95}\text{Mn}_{0.95}\text{Sr}_{0.05}\text{O}_3$), oxygen-deficient 321909-14-2D, Cobalt lanthanum strontium oxide ($\text{CoLa}_{0.9}\text{Sr}_{0.1}\text{O}_3$), oxygen-deficient 321909-15-3D, Cobalt iron strontium oxide ($\text{Co}_{0.7}\text{Fe}_{0.2}\text{Sr}_{0.3}\text{O}_3$), oxygen-deficient 321981-55-9, $\text{Cr}_5\text{Fe}_1\text{Y}$

RL: TEM (Technical or engineered material use); USES (Uses)
(substrate; structures and fabrication techniques for solid state electrochem. devices)

IT 1314-23-4, **Zirconia**, uses

RL: TEM (Technical or engineered material use); USES (Uses)
(yttria-stabilized, substrate; structures and fabrication techniques for solid state electrochem. devices)

IT 1314-36-9, Yttria, uses **12060-08-1**, Scandia

RL: TEM (Technical or engineered material use); USES (Uses)
(**zirconia stabilized** with, substrate; structures and fabrication techniques for solid state electrochem. devices)

L12 ANSWER 11 OF 40 CAPLUS COPYRIGHT 2003 ACS on STN

ACCESSION NUMBER: 2001:20011 CAPLUS

DOCUMENT NUMBER: 134:165589

TITLE: Zirconia-based SOFC with non-noble electrodes fed by air-methane mixture

AUTHOR(S): Demin, Anatoly K.; Gulbis, Fyodor Ya.

CORPORATE SOURCE: Ural Division RAS, Institute of High Temperature Electrochemistry, Yekaterinburg, 620219, Russia

SOURCE: Solid State Ionics (2000), 135(1-4), 451-456
CODEN: SSIOD3; ISSN: 0167-2738

PUBLISHER: Elsevier Science B.V.

DOCUMENT TYPE: Journal

LANGUAGE: English

AB One- and two-chamber solid oxide fuel cells (SOFCs) fed by an air-methane mixt. were studied at 550-700.degree.C. (Y_2O_3)0.04(Sc_2O_3)0.06(ZrO_2)0.9 was used as a solid electrolyte, ceria-doped Ni-YSZ-**cermet** (CNC) and SrO-doped LaMnO_3 (LSM) were used as electrodes. In the expts. with the two-chamber cell, it was stated that the LSM-electrode did not catalyze methane partial oxidn. and its potential was close to the potential of free oxygen mixed with methane and nitrogen. The CNC-electrode was a good catalyst for methane partial oxidn. and its potential was close to the potential of the mixt. formed in methane partial oxidn. process. In the one-chamber cell, the c.d. was about 15 mA/cm² at the terminal voltage 500 mV within an interval of 550-650.degree.C.

REFERENCE COUNT: 4 THERE ARE 4 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

AB One- and two-chamber solid oxide fuel cells (SOFCs) fed by an air-methane mixt. were studied at 550-700.degree.C. (Y_2O_3)0.04(Sc_2O_3)0.06(ZrO_2)0.9 was used as a solid electrolyte, ceria-doped Ni-YSZ-**cermet** (CNC) and SrO-doped LaMnO_3 (LSM) were used as electrodes. In the expts. with the two-chamber cell, it was stated that the LSM-electrode did not catalyze methane partial oxidn. and its potential was close to the potential of free oxygen mixed with methane and nitrogen. The CNC-electrode was a good catalyst for methane partial oxidn. and its potential was close to the potential of the mixt. formed in methane partial oxidn. process. In the one-chamber cell, the c.d. was about 15 mA/cm² at the terminal voltage 500 mV within an interval of 550-650.degree.C.

ST solid oxide fuel cell electrode

IT Fuel cell anodes

Fuel cell electrodes

Fuel cell electrolytes

- (zirconia-based solid oxide **fuel cell** with non-noble electrodes fed by air-methane mixt.)
- IT 1314-36-9, Yttria, uses
 RL: CAT (Catalyst use); DEV (Device component use); PRP (Properties); TEM (Technical or engineered material use); USES (Uses)
 (in ceria-doped zirconia, nickel composite with; zirconia-based solid oxide **fuel cell** with non-noble electrodes fed by air-methane mixt.)
- IT 74-82-8, Methane, processes
 RL: PEP (Physical, engineering or chemical process); PROC (Process)
 (reforming of, over ceria-doped nickel-yttria-**stabilized zirconia cermet**; **zirconia**-based solid oxide **fuel cell** with non-noble electrodes fed by air-methane mixt.)
- IT 1306-38-3, Ceria, uses
 RL: CAT (Catalyst use); DEV (Device component use); PRP (Properties); TEM (Technical or engineered material use); USES (Uses)
 (yttria-**stabilized zirconia** doped with, nickel composite with; **zirconia**-based solid oxide **fuel cell** with non-noble electrodes fed by air-methane mixt.)
- IT 1314-23-4, **Zirconia**, uses
 RL: CAT (Catalyst use); DEV (Device component use); PRP (Properties); TEM (Technical or engineered material use); USES (Uses)
 (yttria-**stabilized**, ceria-doped, nickel composite with; **zirconia**-based solid oxide **fuel cell** with non-noble electrodes fed by air-methane mixt.)
- IT 149026-96-0, Scandium yttrium zirconium oxide (Sc_{0.12}Y_{0.08}Zr_{0.90}O_{2.1})
 RL: DEV (Device component use); TEM (Technical or engineered material use); USES (Uses)
 (zirconia-based solid oxide **fuel cell** with non-noble electrodes fed by air-methane mixt.)

L12 ANSWER 12 OF 40 CAPLUS COPYRIGHT 2003 ACS on STN

ACCESSION NUMBER: 2000:846849 CAPLUS

DOCUMENT NUMBER: 134:88679

TITLE: Internal methanol reforming over samaria-doped ceria electrode in solid oxide **fuel cell**

AUTHOR(S): Tseng, Lin-Kuo; Huang, Ta-Jen

CORPORATE SOURCE: Department of Chemical Engineering, National Tsing Hua University, Hsinchu, 300, Taiwan

SOURCE: Journal of the Chinese Institute of Chemical Engineers (2000), 31(5), 493-498

CODEN: JCICAP; ISSN: 0368-1653

PUBLISHER: Chinese Institute of Chemical Engineers

DOCUMENT TYPE: Journal

LANGUAGE: English

AB Methanol reforming was studied over a ceria-based electrode-catalyst in a solid oxide **fuel cell** under open- and close- circuit conditions. Different additive contents of Samaria-doped ceria (SDC), i.e., (CeO₂)_{1-x}(SmO_{1.5})_x, were investigated to det. its possible application as an electrode-catalyst. Expts. were performed over a temp. range of 750.apprx.900.degree.C and under a steam/methanol molar ratio of 2. It may be concluded that the selectivity for methanol reforming is assocd. with the oxygen ionic cond. It was found that the Ni-SDC **cermet** exhibited a higher open-circuit potential than did that of Ni-YSZ (yttria-**stabilized zirconia**). Furthermore, (CeO₂)_{0.9}(SmO_{1.5})_{0.1} showed the highest depolarization ability in the SDC system because of the enhancement of elec. cond. and also had the highest selectivity for methanol reforming.

REFERENCE COUNT: 9 THERE ARE 9 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

TI Internal methanol reforming over samaria-doped ceria electrode in solid oxide **fuel cell**

AB Methanol reforming was studied over a ceria-based electrode-catalyst in a

solid oxide **fuel cell** under open- and close- circuit conditions. Different additive contents of Samaria-doped ceria (SDC), i.e., $(\text{CeO}_2)_{1-x}(\text{SmO}_{1.5})_x$, were investigated to det. its possible application as an electrode-catalyst. Expts. were performed over a temp. range of 750.apprx.900.degree.C and under a steam/methanol molar ratio of 2. It may be concluded that the selectivity for methanol reforming is assocd. with the oxygen ionic cond. It was found that the Ni-SDC **cermet** exhibited a higher open-circuit potential than did that of Ni-YSZ (yttria-stabilized zirconia). Furthermore, $(\text{CeO}_2)_{0.9}(\text{SmO}_{1.5})_{0.1}$ showed the highest depolarization ability in the SDC system because of the enhancement of elec. cond. and also had the highest selectivity for methanol reforming.

ST methanol reforming samaria ceria electrode **fuel cell**

IT Cermet

Electric current-potential relationship

Open circuit potential

Solid state fuel cells

Steam reforming catalysts

(internal methanol reforming over samaria-doped ceria electrode in solid oxide **fuel cell**)

IT 1306-38-3, Cerium oxide (CeO_2), uses 7440-02-0, Nickel, uses 12060-58-1, Samarium oxide (Sm_2O_3) 55575-06-9, Cerium samarium oxide 64417-98-7, Yttrium zirconium oxide 116875-84-4, Cerium samarium oxide ($\text{Ce}_{0.8}\text{Sm}_{0.2}\text{O}_{1.9}$) 117655-29-5, Cerium samarium oxide ($\text{Ce}_{0.9}\text{Sm}_{0.1}\text{O}_{1.95}$)
RL: CAT (Catalyst use); USES (Uses)

(internal methanol reforming over samaria-doped ceria electrode in solid oxide **fuel cell**)

IT 74-82-8P, Methane, preparation 124-38-9P, Carbon dioxide, preparation 630-08-0P, Carbon monoxide, preparation 1333-74-0P, Hydrogen, preparation

RL: IMF (Industrial manufacture); PEP (Physical, engineering or chemical process); PREP (Preparation); PROC (Process)

(internal methanol reforming over samaria-doped ceria electrode in solid oxide **fuel cell**)

IT 67-56-1, Methanol, reactions

RL: PEP (Physical, engineering or chemical process); RCT (Reactant); PROC (Process); RACT (Reactant or reagent)

(internal methanol reforming over samaria-doped ceria electrode in solid oxide **fuel cell**)

L12 ANSWER 13 OF 40. CAPLUS COPYRIGHT 2003 ACS on STN

ACCESSION NUMBER: 2000:636152 CAPLUS

DOCUMENT NUMBER: 133:196306

TITLE: **Fuel cell** aluminum production

INVENTOR(S): Roha, David J.

PATENT ASSIGNEE(S): Aluminum Company of America, USA

SOURCE: U.S., 14 pp.

CODEN: USXXAM

DOCUMENT TYPE: Patent

LANGUAGE: English

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
US 6117302	A	20000912	US 1998-136097	19980818
PRIORITY APPLN. INFO.:			US 1998-136097	19980818

AB A process and app. are disclosed for electrolytically smelting alumina to produce aluminum metal, including providing a combination solid oxide **fuel cell** and electrolytic smelting cell for the prodn. of aluminum from refined alumina positioned near tile solid oxide **fuel cell**. In one aspect, an alumina ore refinery for producing the refined alumina is positioned near the solid oxide **fuel cell**, and refined alumina is passed at a temp. of

at least 900.degree. C. directly from the alumina ore refinery to the electrolytic smelting cell. In one aspect, the solid oxide **fuel cell** incorporates a planar construction having a solid state cathode material of lanthanum strontium manganate, a solid electrolyte of yttria **stabilized zirconia**, and a nickel/yttria **stabilized zirconia cermet** anode.

REFERENCE COUNT: 6 THERE ARE 6 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

- TI **Fuel cell** aluminum production
- AB A process and app. are disclosed for electrolytically smelting alumina to produce aluminum metal, including providing a combination solid oxide **fuel cell** and electrolytic smelting cell for the prodn. of aluminum from refined alumina positioned near tile solid oxide **fuel cell**. In one aspect, an alumina ore refinery for producing the refined alumina is positioned near the solid oxide **fuel cell**, and refined alumina is passed at a temp. of at least 900.degree. C. directly from the alumina ore refinery to the electrolytic smelting cell. In one aspect, the solid oxide **fuel cell** incorporates a planar construction having a solid state cathode material of lanthanum strontium manganate, a solid electrolyte of yttria **stabilized zirconia**, and a nickel/yttria **stabilized zirconia cermet** anode.
- ST alumina electroredn aluminum prodn app solid oxide **fuel cell**
- IT Heat transfer
(back and forth from electrolysis cell and solid oxide **fuel cell**)
- IT Apparatus
(for aluminum prodn. comprising solid **fuel cell** and electrolytic smelting cell)
- IT Current efficiency
(for aluminum prodn. from smelted alumina in solid state **fuel cell**)
- IT Reduction, electrochemical
(of alumina to metal aluminum in app. comprising solid **fuel cell** and electrolytic smelting cell)
- IT Fuel cells
(solid oxide **fuel cell** aluminum prodn.)
- IT 7429-90-5P, Aluminum, preparation
RL: IMF (Industrial manufacture); PEP (Physical, engineering or chemical process); PREP (Preparation); PROC (Process)
(**fuel cell** aluminum prodn.)
- IT 1344-28-1, Alumina, processes
RL: PEP (Physical, engineering or chemical process); RCT (Reactant); PROC (Process); RACT (Reactant or reagent)
(**fuel cell** aluminum prodn. from smelted alumina)
- IT 59707-46-9, Lanthanum strontium manganate
RL: DEV (Device component use); USES (Uses)
(use as cathode in solid oxide **fuel cell** aluminum prodn.)
- IT 7440-02-0, Nickel, processes
RL: NUU (Other use, unclassified); PEP (Physical, engineering or chemical process); PRP (Properties); PROC (Process); USES (Uses)
(use in **cermet** anode in solid state **fuel cell** for aluminum prodn. from smelted alumina)
- IT 1314-23-4, Zirconia, processes
RL: NUU (Other use, unclassified); PEP (Physical, engineering or chemical process); PRP (Properties); PROC (Process); USES (Uses)
(yttria **stabilized**; use as electrolyte in solid state **fuel cell** for aluminum prodn. from smelted alumina)

TITLE: Partial oxidation of methane to synthesis gas using
 Ni/Ca_{0.8}Sr_{0.2}TiO₃ anode catalyst

AUTHOR(S): Hamakawa, Satoshi; Shiozaki, Ryuji; Hayakawa, Takashi;
 Suzuki, Kunio; Murata, Kazuhisa; Takehira, Katsuomi;
 Koizumi, Masaki; Nakamura, Junji; Uchijima, Toshio

CORPORATE SOURCE: National Institute of Materials and Chemical Research,
 Ibaraki; 305-8565, Japan

SOURCE: Journal of the Electrochemical Society (2000), 147(3),
 839-844
 CODEN: JESOAN; ISSN: 0013-4651

PUBLISHER: Electrochemical Society

DOCUMENT TYPE: Journal

LANGUAGE: English

AB A high performance electrochem. reactor for the partial oxidn. of CH₄ into
 synthesis gas has been developed by fixing powder catalysts on the anode
 surface for the natural gas conversion. A powd. catalyst of
 Ni_{1.0}/Ca_{0.8}Sr_{0.2}TiO₃ fixed by a gold paste has excellent catalytic
 activity without significant deactivation by the carbon deposition. The
 conversion of CH₄ at 1173 K is 38.8% with the selectivity to CO of 98.9%.
 The advantage of this system is the sepn. of N₂ and O₂ in the cathode
 chamber when using air as the oxidant gas instead of pure oxygen.
 Furthermore, an elec. power d. of 14.5 mW cm⁻² has been obtained by this
 system at 1173 K. The amt. of carbon deposition over the
 Ni_{1.0}/Ca_{0.8}Sr_{0.2}TiO₃ is ten times lower than that over the Ni-yttria-
stabilized zirconia cermet of a typical anode
 material in the solid oxide **fuel cell** system or the
 typical Ni/Al₂O₃ catalyst for CH₄ conversion. This is attributed to the
 oxidn. of carbon deposits by the lattice oxygen species that migrated from
 the oxide to the Ni-Ca_{0.8}Sr_{0.2}TiO₃ boundary. The synthesis gas is
 considered to be formed not only by the steam reforming of CH₄ including
 the complete oxidn. but also by the direct oxidn. of CH₄.

REFERENCE COUNT: 30 THERE ARE 30 CITED REFERENCES AVAILABLE FOR THIS
 RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

AB A high performance electrochem. reactor for the partial oxidn. of CH₄ into
 synthesis gas has been developed by fixing powder catalysts on the anode
 surface for the natural gas conversion. A powd. catalyst of
 Ni_{1.0}/Ca_{0.8}Sr_{0.2}TiO₃ fixed by a gold paste has excellent catalytic
 activity without significant deactivation by the carbon deposition. The
 conversion of CH₄ at 1173 K is 38.8% with the selectivity to CO of 98.9%.
 The advantage of this system is the sepn. of N₂ and O₂ in the cathode
 chamber when using air as the oxidant gas instead of pure oxygen.
 Furthermore, an elec. power d. of 14.5 mW cm⁻² has been obtained by this
 system at 1173 K. The amt. of carbon deposition over the
 Ni_{1.0}/Ca_{0.8}Sr_{0.2}TiO₃ is ten times lower than that over the Ni-yttria-
stabilized zirconia cermet of a typical anode
 material in the solid oxide **fuel cell** system or the
 typical Ni/Al₂O₃ catalyst for CH₄ conversion. This is attributed to the
 oxidn. of carbon deposits by the lattice oxygen species that migrated from
 the oxide to the Ni-Ca_{0.8}Sr_{0.2}TiO₃ boundary. The synthesis gas is
 considered to be formed not only by the steam reforming of CH₄ including
 the complete oxidn. but also by the direct oxidn. of CH₄.

ST electrochem reactor partial oxidn methane synthesis gas; **fuel**
cell partial oxidn methane synthesis gas

IT 1344-28-1, Alumina, uses 7440-02-0, Nickel, uses 12047-27-7,
 Barium titanium oxide batio3, uses 12049-50-2, Calcium titanium oxide
 catio3 12060-59-2, Strontium titanium oxide srtio3 112721-99-0
 118558-32-0, Calcium strontium titanium oxide Ca_{0.8}Sr_{0.2}TiO₃
 RL: CAT (Catalyst use); USES (Uses)

(partial oxidn. of methane to synthesis gas using Ni/Ca_{0.8}Sr_{0.2}TiO₃
 anode catalyst)

TITLE: Electrode materials for intermediate temperature
proton-conducting fuel cells
AUTHOR(S): Tao, S. W.; Wu, Q. Y.; Peng, D. K.; Meng, G. Y.
CORPORATE SOURCE: Department of Materials Science and Engineering,
University of Science and Technology of China, Hefei,
230026, Peop. Rep. China
SOURCE: Journal of Applied Electrochemistry (2000), 30(2),
153-157
CODEN: JAELEBJ; ISSN: 0021-891X
PUBLISHER: Kluwer Academic Publishers
DOCUMENT TYPE: Journal
LANGUAGE: English

AB Some electrode materials for intermediate temp. proton-conducting fuel
cells are analyzed from the perspective of surface reaction and ionic
cond. type. The performance of H₂/O₂ fuel cells using these materials as
electrodes with LiNaSO₄-Al₂O₃ as the electrolyte indicates that Ni-Al
alloy, Ni-Al₂O₃ catalyst and Ni-YSZ **cermet** are potential
candidates for anode materials and that LiNiO₂, LiCoO₂, Ag-SnO₂ and
La_{0.8}Sr_{0.2}MnO₃ are good candidates for cathode materials. Among the
tested electrode materials, for the same electrolyte, the LiNiO₂/Ni-Al₂O₃
electrode pair gives the best cell performance.

REFERENCE COUNT: 17 THERE ARE 17 CITED REFERENCES AVAILABLE FOR THIS
RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

AB Some electrode materials for intermediate temp. proton-conducting fuel
cells are analyzed from the perspective of surface reaction and ionic
cond. type. The performance of H₂/O₂ fuel cells using these materials as
electrodes with LiNaSO₄-Al₂O₃ as the electrolyte indicates that Ni-Al
alloy, Ni-Al₂O₃ catalyst and Ni-YSZ **cermet** are potential
candidates for anode materials and that LiNiO₂, LiCoO₂, Ag-SnO₂ and
La_{0.8}Sr_{0.2}MnO₃ are good candidates for cathode materials. Among the
tested electrode materials, for the same electrolyte, the LiNiO₂/Ni-Al₂O₃
electrode pair gives the best cell performance.

ST **fuel cell** electrode material

IT **Fuel cell** electrodes

Fuel cells

(electrode materials for intermediate temp. proton-conducting fuel
cells)

IT 1344-28-1, Alumina, uses 7440-02-0, Nickel, uses 7440-22-4,
Silver, uses 11114-68-4 12031-65-1, Lithium nickel oxide linio₂
12057-17-9, Lithium manganese oxide limn₂o₄ 12190-79-3, Cobalt lithium
oxide colio₂ 13568-34-8, Lithium sodium sulfate 18282-10-5, Tin
dioxide 64417-98-7, Yttrium zirconium oxide 108916-22-9, Lanthanum
manganese strontium oxide La_{0.8}MnSr_{0.2}O₃ 112721-99-0

RL: DEV (Device component use); USES (Uses)

(electrode materials for intermediate temp. proton-conducting fuel
cells)

IT 1314-23-4, **Zirconia**, uses

RL: DEV (Device component use); USES (Uses)

(yttria-**stabilized**; electrode materials for intermediate
temp. proton-conducting fuel cells)

IT 1314-36-9, Yttria, uses

RL: DEV (Device component use); USES (Uses)

(**zirconia stabilized** with; electrode materials for
intermediate temp. proton-conducting fuel cells)

L12 ANSWER 16 OF 40 CAPLUS COPYRIGHT 2003 ACS on STN

ACCESSION NUMBER: 1999:723542 CAPLUS

DOCUMENT NUMBER: 131:325021

TITLE: Optimization of anodes of the high-temperature
fuel cell by correlation of
manufacture processes, microstructure, and properties
AUTHOR(S): Simwonis, Dimitrios
CORPORATE SOURCE: Inst. Werkstoffe Verfahren Energietechnik,
Forschungszentrum Julich G.m.b.H., Julich, D-52425,

SOURCE: Germany
Berichte des Forschungszentrums Juelich (1999),
Juel-3678, 1-124 pp.
CODEN: FJBEE5; ISSN: 0366-0885
DOCUMENT TYPE: Report
LANGUAGE: German

AB Solid oxide fuel cells (SOFCs) are electrochem. devices which directly convert the chem. energy of a fuel into electricity. At the Research Center Julich, the planar substrate concept was developed, in which the anode, which is a **cermet** of nickel and yttria-stabilized **zirconia**, consists of a supporting anode substrate, an a thin finely structured coating. The anode substrate currently used has been studied in detail using various methods of characterization, and its properties and microstructural features were detd. for further optimization expts. Various low-cost starting materials and different processing techniques were used for substrate prodn. These substrates were evaluated on the basis of their properties and microstructure with a view to application in solid oxide fuel cells. A series of microstructural tests have been carried out on anode substrates and anode layers with respect to their long-term stability. Aging of the anodes due to Ni agglomeration was described quant. and in terms of a model. Low Ni agglomeration was obsd. whenever both Ni as well as YSZ and pores were as finely distributed as possible.

REFERENCE COUNT: 123 THERE ARE 123 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE REFORMAT

TI Optimization of anodes of the high-temperature **fuel cell** by correlation of manufacture processes, microstructure, and properties

AB Solid oxide fuel cells (SOFCs) are electrochem. devices which directly convert the chem. energy of a fuel into electricity. At the Research Center Julich, the planar substrate concept was developed, in which the anode, which is a **cermet** of nickel and yttria-stabilized **zirconia**, consists of a supporting anode substrate, an a thin finely structured coating. The anode substrate currently used has been studied in detail using various methods of characterization, and its properties and microstructural features were detd. for further optimization expts. Various low-cost starting materials and different processing techniques were used for substrate prodn. These substrates were evaluated on the basis of their properties and microstructure with a view to application in solid oxide fuel cells. A series of microstructural tests have been carried out on anode substrates and anode layers with respect to their long-term stability. Aging of the anodes due to Ni agglomeration was described quant. and in terms of a model. Low Ni agglomeration was obsd. whenever both Ni as well as YSZ and pores were as finely distributed as possible.

ST **fuel cell** anode porous **cermet** substrate

IT Cermet

Fuel cell anodes

Solid state fuel cells

(YSZ-Ni porous **cermet** substrate anodes for solid oxide fuel cells)

IT Permeability

(gas; of YSZ-Ni porous **cermet** substrate anodes for solid oxide fuel cells)

IT Agglomeration

Aging, materials

Bending strength

Electric conductivity

Microstructure

Oxidation kinetics

Pore size distribution

Pore structure

Porosity

Stability

Thermal expansion

(of YSZ-Ni porous **cermet** substrate anodes for solid oxide fuel cells)

- IT 1344-28-1, Aluminum oxide (Al₂O₃), uses 12004-35-2, Aluminum nickel oxide (Al₂NiO₄)
 RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PRP (Properties); PROC (Process); USES (Uses)
 (Al₂O₃-Ni porous **cermet** substrate anodes for solid oxide fuel cells)
- IT 12035-39-1, Nickel titanium oxide (NiTiO₃)
 RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PRP (Properties); PROC (Process); USES (Uses)
 (TiO₂-Ni porous **cermet** substrate anodes for solid oxide fuel cells)
- IT 1313-99-1, Nickel oxide (NiO), uses 112721-99-0 114168-16-0, Yttrium zirconium oxide (Y_{0.16}Zr_{0.92}O_{2.08})
 RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PRP (Properties); PROC (Process); USES (Uses)
 (YSZ-Ni porous **cermet** substrate anodes for solid oxide fuel cells)
- IT 13463-67-7, Titania, uses
 RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PRP (Properties); PROC (Process); USES (Uses)
 (of YSZ-Ni porous **cermet** substrate anodes for solid oxide fuel cells)
- IT 1314-23-4, Zirconia, uses
 RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PRP (Properties); PROC (Process); USES (Uses)
 (yttria-stabilized; YSZ-Ni porous **cermet** substrate anodes for solid oxide fuel cells)
- IT 1314-36-9, Yttria, uses
 RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PRP (Properties); PROC (Process); USES (Uses)
 (zirconia stabilized with; YSZ-Ni porous **cermet** substrate anodes for solid oxide fuel cells)

L12 ANSWER 17 OF 40 CAPLUS COPYRIGHT 2003 ACS on STN

ACCESSION NUMBER: 1999:723304 CAPLUS
 DOCUMENT NUMBER: 131:312500
 TITLE: Solid oxide fuel cell with
 sintered anode of metallic particles and oxides
 INVENTOR(S): Van Berkel, Franciscus Petrus Felix; Schipper,
 Gerardus Simon; De Jong, Jan Peter
 PATENT ASSIGNEE(S): Stichting Energieonderzoek Centrum Nederland, Neth.
 SOURCE: PCT Int. Appl., 15 pp.
 CODEN: PIXXD2
 DOCUMENT TYPE: Patent
 LANGUAGE: English
 FAMILY ACC. NUM. COUNT: 1
 PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 9957779	A1	19991111	WO 1999-NL269	19990504
W:	AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZA, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM			
RW:	GH, GM, KE, LS, MW, SD, SL, SZ, UG, ZW, AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG			
NL 1009060	C2	19991105	NL 1998-1009060	19980504

CA 2330661	AA	19991111	CA 1999-2330661	19990504
AU 9938526	A1	19991123	AU 1999-38526	19990504
AU 748484	B2	20020606		
EP 1080510	A1	20010307	EP 1999-921279	19990504
EP 1080510	B1	20030709		

R: CH, DE, DK, ES, FR, GB, IT, LI, NL

JP 2002513997	T2	20020514	JP 2000-547670	19990504
US 6482539	B1	20021119	US 2000-674774	20001106

PRIORITY APPLN. INFO.:

NL 1998-1009060 A 19980504

WO 1999-NL269 W 19990504

AB Anode for an electrochem. cell consists of a mixt. of electron- and ion-conducting particles. The ion-conducting particles consist of oxides. The anode is made up in such a way that that part of anode located close to the electrolyte comprises small oxygen-ion-conducting particles, while the part located closer to the current collector comprises coarser oxide particles. By this means it is possible to provide for optimum adaptation to the various requirements which are imposed in respect of the behavior of the anode located at the electrolyte or at the current collector.

REFERENCE COUNT: 8 THERE ARE 8 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

TI Solid oxide **fuel cell** with sintered anode of metallic particles and oxides

ST **fuel cell** anode metallic particle oxide

IT Rare earth compounds
 RL: DEV (Device component use); USES (Uses)
 (cerates; solid oxide **fuel cell** with sintered anode of metallic particles and oxides)

IT Alkaline earth metals
 Rare earth metals, uses
 RL: MOA (Modifier or additive use); USES (Uses)
 (fluorites doped with; solid oxide **fuel cell** with sintered anode of metallic particles and oxides)

IT Group IIIA element compounds
 RL: DEV (Device component use); USES (Uses)
 (gallates; solid oxide **fuel cell** with sintered anode of metallic particles and oxides)

IT Zirconates
 RL: DEV (Device component use); USES (Uses)
 (ion-conducting; solid oxide **fuel cell** with sintered anode of metallic particles and oxides)

IT **Fuel cell** anodes
 Solid state fuel cells
 (solid oxide **fuel cell** with sintered anode of metallic particles and oxides)

IT Noble metals
 RL: DEV (Device component use); USES (Uses)
 (solid oxide **fuel cell** with sintered anode of metallic particles and oxides)

IT 1344-28-1, Alumina, uses
 RL: DEV (Device component use); USES (Uses)
 (**cermet**; solid oxide **fuel cell** with sintered anode of metallic particles and oxides)

IT 1306-38-3, Ceria, uses 1314-23-4, Zirconia, uses 12055-23-1, Hafnia
 RL: DEV (Device component use); USES (Uses)
 (rare earth or alk. earth metal-doped; solid oxide **fuel cell** with sintered anode of metallic particles and oxides)

IT 7440-02-0, Nickel, uses 7440-50-8, Copper, uses 64417-98-7, Yttrium zirconium oxide 152233-89-1, Cerium gadolinium oxide ce0.9gd0.1ol.95
 RL: DEV (Device component use); USES (Uses)
 (solid oxide **fuel cell** with sintered anode of metallic particles and oxides)

IT 1314-36-9, Yttria, uses
 RL: DEV (Device component use); USES (Uses)

(**zirconia stabilized** with; solid oxide **fuel**
cell with sintered anode of metallic particles and oxides)

L12 ANSWER 18 OF 40 CAPLUS COPYRIGHT 2003 ACS on STN

ACCESSION NUMBER: 1999:355925 CAPLUS

DOCUMENT NUMBER: 130:354697

TITLE: Testing tubular solid oxide fuel cells in
nonsteady-state conditions

AUTHOR(S): Kharton, V. V.; Naumovich, E. N.; Tikhonovich, V. N.;
Bashmakov, I. A.; Boginsky, L. S.; Kovalevsky, A. V.

CORPORATE SOURCE: Institute of Physicochemical Problems, Belarus State
University, Minsk, 220080, Belarus

SOURCE: Journal of Power Sources (1999), 79(2), 242-249
CODEN: JPSODZ; ISSN: 0378-7753

PUBLISHER: Elsevier Science S.A.

DOCUMENT TYPE: Journal

LANGUAGE: English

AB Fabrication of tubular-type solid oxide fuel cells (SOFCs) with yttria-
stabilized zirconia electrolyte, cathodes and current
collectors of lanthanum strontium manganite (LSM) is described.
Particular emphasis is given to the techniques of producing LSM tubes by
the isostatic pressing method, prepg. oxide electrodes via cellulose
precursor decompn., and activation of SOFC electrodes by applying
dispersed catalysts onto their surface. Coating nickel **cermet**
anodes with dispersed ceria and depositing praseodymium oxide onto
manganite cathode surface was found to result in improving SOFC
performance. Testing single cells with externally switched pulse load
demonstrated a possibility to optimize the SOFC operating mode at a given
resistance of the closing circuit by variation of the pulse
period-to-pulse duration ratio of the pulses which open the circuit. No
effect of the pulse load frequency on SOFC performance was obsd. in the
frequency range from 2 Hz to 50 kHz. The results of testing SOFCs in
nonsteady-state conditions suggest applicability of the externally
switched pulse load to match resistances of single cells in the SOFC
stacks.

REFERENCE COUNT: 28 THERE ARE 28 CITED REFERENCES AVAILABLE FOR THIS
RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

AB Fabrication of tubular-type solid oxide fuel cells (SOFCs) with yttria-
stabilized zirconia electrolyte, cathodes and current
collectors of lanthanum strontium manganite (LSM) is described.
Particular emphasis is given to the techniques of producing LSM tubes by
the isostatic pressing method, prepg. oxide electrodes via cellulose
precursor decompn., and activation of SOFC electrodes by applying
dispersed catalysts onto their surface. Coating nickel **cermet**
anodes with dispersed ceria and depositing praseodymium oxide onto
manganite cathode surface was found to result in improving SOFC
performance. Testing single cells with externally switched pulse load
demonstrated a possibility to optimize the SOFC operating mode at a given
resistance of the closing circuit by variation of the pulse
period-to-pulse duration ratio of the pulses which open the circuit. No
effect of the pulse load frequency on SOFC performance was obsd. in the
frequency range from 2 Hz to 50 kHz. The results of testing SOFCs in
nonsteady-state conditions suggest applicability of the externally
switched pulse load to match resistances of single cells in the SOFC
stacks.

ST solid oxide **fuel cell** tubular testing

IT 1306-38-3, Ceria, uses

RL: DEV (Device component use); MOA (Modifier or additive use); USES
(Uses)

(anode coated with; fabrication and testing of tubular solid oxide fuel
cells in nonsteady-state conditions)

IT 1314-23-4, **Zirconia**, uses

RL: DEV (Device component use); USES (Uses)

(yttria-**stabilized**, electrolyte; fabrication and testing of

tubular solid oxide fuel cells in nonsteady-state conditions)
 IT 1314-36-9, Yttria, uses
 RL: DEV (Device component use); USES (Uses)
 (zirconia stabilized with, electrolyte; fabrication
 and testing of tubular solid oxide fuel cells in nonsteady-state
 conditions)

L12 ANSWER 19 OF 40 CAPLUS COPYRIGHT 2003 ACS on STN
 ACCESSION NUMBER: 1998:31270 CAPLUS
 DOCUMENT NUMBER: 128:117317
 TITLE: Manufacture of anodes for solid electrolyte fuel cells
 INVENTOR(S): Hishinuma, Yuichi; Matsusaki, Yoshio
 PATENT ASSIGNEE(S): Tokyo Gas Co., Ltd., Japan
 SOURCE: Jpn. Kokai Tokkyo Koho, 10 pp.
 CODEN: JKXXAF
 DOCUMENT TYPE: Patent
 LANGUAGE: Japanese
 FAMILY ACC. NUM. COUNT: 1
 PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
JP 10003930	A2	19980106	JP 1996-340870	19961220
WO 9828808	A1	19980702	WO 1997-JP2656	19970730
W: CA, US				
RW: AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE				
EP 955685	A1	19991110	EP 1997-933855	19970730
R: CH, DE, GB, LI				
PRIORITY APPLN. INFO.:			JP 1996-98155	19960419
			JP 1996-340870	19961220
			WO 1997-JP2656	19970730

AB The stabilized yttria-Ni **cermet** anodes, for **fuel**
cell stacks contg. alternate unit cells and separators, are prepd.
 by adding solns. of org. compds. of Y and transition metals to a soln. of
 an org. Zr compd., mixing the soln. mixt. with powd. NiO to form a slurry,
 hydrolyzing the slurry, condensation polymg. the hydrolyzate, thermally
 decomp. the polymer, and annealing. The NiO powder may be mixed with
 powd. solid solns. of CeO and oxides of di- and tri-valent metals. The
 transition metal is preferably Ce, Ti, or Pr and the di- and trivalent
 metal oxides are selected from BeO, MgO, CaO, SrO, BaO, Sm2O3, Y2O3,
 La2O3, Gd2O3, Sc2O3, Pr2O3, Nd2O3, Eu2O3, Yb2O3, Dy2O3, and Ho2O3.

AB The stabilized yttria-Ni **cermet** anodes, for **fuel**
cell stacks contg. alternate unit cells and separators, are prepd.
 by adding solns. of org. compds. of Y and transition metals to a soln. of
 an org. Zr compd., mixing the soln. mixt. with powd. NiO to form a slurry,
 hydrolyzing the slurry, condensation polymg. the hydrolyzate, thermally
 decomp. the polymer, and annealing. The NiO powder may be mixed with
 powd. solid solns. of CeO and oxides of di- and tri-valent metals. The
 transition metal is preferably Ce, Ti, or Pr and the di- and trivalent
 metal oxides are selected from BeO, MgO, CaO, SrO, BaO, Sm2O3, Y2O3,
 La2O3, Gd2O3, Sc2O3, Pr2O3, Nd2O3, Eu2O3, Yb2O3, Dy2O3, and Ho2O3.

ST solid electrolyte **fuel cell cermet** anode;
fuel cell cermet anode manuf; nickel YSZ anode
 manuf **fuel cell**

IT **Fuel cell** anodes
 (compns. and manuf. of nickel-yttria **stabilized**
zirconia cermet anodes for solid electrolyte fuel
 cells)

IT 1304-28-5, Barium oxide, uses 1304-56-9, Beryllium oxide, uses
 1305-78-8, Calcia, uses 1308-87-8, Dysprosium oxide (Dy2O3) 1308-96-9,
 Europium oxide (Eu2O3) 1309-48-4, Magnesia, uses 1312-81-8, Lanthanum
 oxide (La2O3) 1313-97-9, Neodymium oxide (Nd2O3) 1314-11-0, Strontium
 oxide, uses 1314-37-0, Ytterbium oxide (Yb2O3) 12036-32-7,
 Praseodymium oxide (Pr2O3) 12060-08-1, Scandium oxide (Sc2O3)

12064-62-9, Gadolinium oxide (Gd₂O₃) 116875-84-4, Cerium samarium oxide (Ce_{0.8}Sm_{0.2}O_{1.9}) 143334-25-2, Cerium yttrium zirconium oxide 201490-56-4, Cerium samarium oxide 9, cerium yttrium zirconium oxide 10, nickel 81

RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)

(comps. and manuf. of nickel-yttria **stabilized zirconia cermet** anodes for solid electrolyte fuel cells)

IT 1313-99-1, Nickel oxide (NiO), uses

RL: NUU (Other use, unclassified); USES (Uses)

(in manuf. of nickel-yttria **stabilized zirconia cermet** anodes for solid electrolyte fuel cells)

L12 ANSWER 20 OF 40 CAPLUS COPYRIGHT 2003 ACS on STN

ACCESSION NUMBER: 1997:346419 CAPLUS

DOCUMENT NUMBER: 127:20800

TITLE: Ceramic materials containing rare earth oxides for solid oxide **fuel cell**

AUTHOR(S): Eguchi, Koichi

CORPORATE SOURCE: Department of Materials Science and Technology, Graduate School of Engineering Sciences, Kyushu University, Kasugakoen, Kasuga, Fukuoka, Japan

SOURCE: Journal of Alloys and Compounds (1997), 250(1-2), 486-491

CODEN: JALCEU; ISSN: 0925-8388

PUBLISHER: Elsevier

DOCUMENT TYPE: Journal

LANGUAGE: English

AB Materials for a solid oxide **fuel cell** were investigated aiming esp. at low temp. operation of the cell. Although yttria-**stabilized zirconia** has been most popularly investigated as an electrolyte for the cell, the cond. reaches the allowable level only around or higher than 1000.degree.C. The use of a ceria-based electrolyte, esp. samaria doped ceria, significantly lowered the operation temp. of the cell due to its high oxide ion cond. The redn. of ceria with H₂ and resultant electronic conduction could be avoided by the coating of YSZ on to the anode side of the ceria. The ceria layer facing the air electrode is effective in reducing cathodic polarization. Ni-ceria **cermet** exhibited higher fuel electrode performance than Ni-YSZ **cermet** in lowering polarization.

TI Ceramic materials containing rare earth oxides for solid oxide **fuel cell**

AB Materials for a solid oxide **fuel cell** were investigated aiming esp. at low temp. operation of the cell. Although yttria-**stabilized zirconia** has been most popularly investigated as an electrolyte for the cell, the cond. reaches the allowable level only around or higher than 1000.degree.C. The use of a ceria-based electrolyte, esp. samaria doped ceria, significantly lowered the operation temp. of the cell due to its high oxide ion cond. The redn. of ceria with H₂ and resultant electronic conduction could be avoided by the coating of YSZ on to the anode side of the ceria. The ceria layer facing the air electrode is effective in reducing cathodic polarization. Ni-ceria **cermet** exhibited higher fuel electrode performance than Ni-YSZ **cermet** in lowering polarization.

ST rare earth oxide **fuel cell**; electrolyte anode solid oxide **fuel cell**; ceria samaria doped electrolyte **fuel cell**; nickel yttria zirconia **cermet** anode

IT Electric conductivity

Fuel cell anodes

Fuel cell electrolytes

(ceramic materials contg. rare earth oxides for solid oxide **fuel cell**)

IT 1306-38-3, Ceria, uses 7440-02-0, Nickel, uses 55575-06-9,

Cerium samarium oxide 64417-98-7, Yttrium zirconium oxide 114168-16-0, Yttrium zirconium oxide (Y_{0.16}Zr_{0.92}O_{2.08}) 116845-73-9, Calcium cerium oxide (Ca_{0.2}Ce_{0.8}O_{1.8}) 116875-84-4, Cerium samarium oxide (Ce_{0.8}Sm_{0.2}O_{1.9}) 117655-31-9, Cerium lanthanum oxide (Ce_{0.8}La_{0.2}O_{1.9}) 117655-32-0, Cerium gadolinium oxide (Ce_{0.8}Gd_{0.2}O_{1.9}) 117655-33-1, Cerium thulium oxide (Ce_{0.8}Tm_{0.2}O_{1.9}) 117655-34-2, Cerium ytterbium oxide (Ce_{0.8}Yb_{0.2}O_{1.9}) 117655-35-3, Cerium erbium oxide (Ce_{0.8}Er_{0.2}O_{1.9}) 117655-36-4, Cerium neodymium oxide (Ce_{0.8}Nd_{0.2}O_{1.9}) 117655-37-5, Cerium holmium oxide (Ce_{0.8}Ho_{0.2}O_{1.9}) 117655-38-6, Cerium dysprosium oxide (Ce_{0.8}Dy_{0.2}O_{1.9})

RL: DEV (Device component use); USES (Uses)

(ceramic materials contg. rare earth oxides for solid oxide fuel cell)

IT 1314-23-4, Zirconium oxide (ZrO₂), uses

RL: DEV (Device component use); USES (Uses)

(yttria stabilized with; ceramic materials contg. rare earth oxides for solid oxide fuel cell)

IT 1314-36-9, Yttrium oxide (Y₂O₃), uses

RL: DEV (Device component use); USES (Uses)

(zirconia contg.; ceramic materials contg. rare earth oxides for solid oxide fuel cell)

L12 ANSWER 21 OF 40 CAPLUS COPYRIGHT 2003 ACS on STN

ACCESSION NUMBER: 1997:324494 CAPLUS

DOCUMENT NUMBER: 127:38345

TITLE: Polarization behavior of high temperature solid oxide electrolysis cells (SOEC)

AUTHOR(S): Momma, Akihiko; Kato, Tohru; Kaga, Yasuo; Nagata, Susumu

CORPORATE SOURCE: Energy Materials Section, Energy Fundamentals Division, Electrotechnical Laboratory, Ibaraki, 305, Japan

SOURCE: Journal of the Ceramic Society of Japan (1997), 105(May), 369-373

CODEN: JCSJEW

PUBLISHER: Ceramic Society of Japan

DOCUMENT TYPE: Journal

LANGUAGE: Japanese

AB The behavior of solid oxide electrolysis cells (SOEC) was investigated as compared with that of solid state fuel cell (SOFC)

using small cells proposed on yttria stabilized zirconia

(YSZ) planar disks. Ni-YSZ cermet neg. electrode showed asym.

behavior indicating the existence of diffusion limited process in the electrolysis direction, although the behavior was strongly dependent on the electrode prepn. The behavior of pos. electrodes made by using perovskite type oxides was also investigated. When polarized anodically, the pos. electrode showed degrdn. behavior which ended up with electrode delamination from electrolyte. The degrdn. rate was remarkably decreased by improving the initial polarization performance of the electrode or by using a mixed ceria intermediate layer between YSZ and electrode.

Polarization measurements of SOEC were conducted at 1173 K, 1223 K and 1273 K with various water content in hydrogen simulating the atm. of various water electrolysis rate. The cell was shown to work at a high c.d. and at high electrolysis rate without suffering from diffusion limiting current.

AB The behavior of solid oxide electrolysis cells (SOEC) was investigated as compared with that of solid state fuel cell (SOFC)

using small cells proposed on yttria stabilized zirconia

(YSZ) planar disks. Ni-YSZ cermet neg. electrode showed asym.

behavior indicating the existence of diffusion limited process in the electrolysis direction, although the behavior was strongly dependent on the electrode prepn. The behavior of pos. electrodes made by using perovskite type oxides was also investigated. When polarized anodically, the pos. electrode showed degrdn. behavior which ended up with electrode

delamination from electrolyte. The degrdn. rate was remarkably decreased by improving the initial polarization performance of the electrode or by using a mixed ceria intermediate layer between YSZ and electrode. Polarization measurements of SOEC were conducted at 1173 K, 1223 K and 1273 K with various water content in hydrogen simulating the atm. of various water electrolysis rate. The cell was shown to work at a high c.d. and at high electrolysis rate without suffering from diffusion limiting current.

- IT Dielectric polarization
(polarization behavior of yttria-stabilized zirconia high-temp. solid oxide electrolysis cells)
- IT Electrolytic cells
(yttria-stabilized zirconia; polarization behavior of yttria-stabilized zirconia high-temp. solid oxide electrolysis cells)
- IT 7440-02-0, Nickel, processes 114168-16-0, Yttrium zirconium oxide (Y0.16Zr0.92O2.08)
RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PRP (Properties); PROC (Process); USES (Uses)
(anode; polarization behavior of yttria-stabilized zirconia high-temp. solid oxide electrolysis cells)
- IT 12016-86-3, Cobalt Lanthanum oxide colao3 110781-51-6, Lanthanum manganese strontium oxide la0.9mnsr0.1o3
RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PRP (Properties); PROC (Process); USES (Uses)
(cathode; polarization behavior of yttria-stabilized zirconia high-temp. solid oxide electrolysis cells)
- IT 1306-38-3, Cerium oxide (CeO2), processes
RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(interlayer; polarization behavior of yttria-stabilized zirconia high-temp. solid oxide electrolysis cells)
- IT 1314-23-4, Zirconium oxide (ZrO2), processes 64417-98-7, Yttrium Zirconium oxide
RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PRP (Properties); PROC (Process); USES (Uses)
(solid electrolyte; polarization behavior of yttria-stabilized zirconia high-temp. solid oxide electrolysis cells)
- IT 1314-36-9, Yttrium oxide (Y2O3), processes
RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PRP (Properties); PROC (Process); USES (Uses)
(zirconium electrolyte stabilized by; polarization behavior of yttria-stabilized zirconia high-temp. solid oxide electrolysis cells)

L12 ANSWER 22 OF 40 CAPLUS COPYRIGHT 2003 ACS on STN

ACCESSION NUMBER: 1996:731899 CAPLUS
DOCUMENT NUMBER: 125:334164
TITLE: Solid electrolyte fuel cells and manufacture of the fuel cells
INVENTOR(S): Tamura, Moritoshi; Mizutani, Yasunobu; Kawai, Masayuki; Nomura, Kazuhiro
PATENT ASSIGNEE(S): Toho Gas Kk, Japan
SOURCE: Jpn. Kokai Tokkyo Koho, 6 pp.
CODEN: JKXXAF
DOCUMENT TYPE: Patent
LANGUAGE: Japanese
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
JP 08250134	A2	19960927	JP 1995-83196	19950314
PRIORITY APPLN. INFO.:			JP 1995-83196	19950314

AB The fuel cells have a La Sr manganate cathode bonded to a ZrO₂ based solid electrolyte, where the electrolyte is stabilized with Sc₂O₃ to suppress the diffusion of Mn ion from the cathode into the electrolyte. The fuel cells are prepd. by applying a Ni **cermet** anode material to 1 side of a scandia stabilized ZrO₂ electrolyte plate, applying a La Sr manganate cathode material to the other side of the electrolyte, and sintering.

AB The fuel cells have a La Sr manganate cathode bonded to a ZrO₂ based solid electrolyte, where the electrolyte is stabilized with Sc₂O₃ to suppress the diffusion of Mn ion from the cathode into the electrolyte. The fuel cells are prepd. by applying a Ni **cermet** anode material to 1 side of a scandia stabilized ZrO₂ electrolyte plate, applying a La Sr manganate cathode material to the other side of the electrolyte, and sintering.

ST **fuel cell** scandia zirconia electrolyte; cathode manganese diffusion prevention **fuel cell**

IT **Fuel-cell** electrolytes
(scandia **stabilized zirconia** electrolyte for preventing diffusion of manganese ion from cathodes in fuel cells)

IT Fuel cells
(solid-state, scandia **stabilized zirconia** electrolyte for preventing diffusion of manganese ion from cathodes in fuel cells)

IT 1314-23-4, **Zirconia**, uses 12060-08-1, Scandia 111569-09-6, Scandium zirconium oxide 120605-82-5, Lanthanum manganese strontium oxide (La_{0.85}MnSr_{0.15}O₃)
RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(scandia **stabilized zirconia** electrolyte for preventing diffusion of manganese ion from cathodes in fuel cells)

IT 7439-96-5, Manganese, miscellaneous
RL: MSC (Miscellaneous)
(scandia **stabilized zirconia** electrolyte for preventing diffusion of manganese ion from cathodes in fuel cells)

L12 ANSWER 23 OF 40 CAPLUS COPYRIGHT 2003 ACS on STN

ACCESSION NUMBER: 1996:731898 CAPLUS
DOCUMENT NUMBER: 125:334163
TITLE: Solid electrolyte fuel cells and manufacture of the fuel cells
INVENTOR(S): Tamura, Moritoshi; Mizutani, Yasunobu; Kawai, Masayuki; Nomura, Kazuhiro
PATENT ASSIGNEE(S): Toho Gas Kk, Japan
SOURCE: Jpn. Kokai Tokkyo Koho, 9 pp.
CODEN: JKXXAF
DOCUMENT TYPE: Patent
LANGUAGE: Japanese
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
JP 08250135	A2	19960927	JP 1995-83197	19950314
PRIORITY APPLN. INFO.:			JP 1995-83197	19950314

AB The fuel cells have a La Sr manganate cathode bonded to a ZrO₂ based solid electrolyte, where the electrolyte is stabilized with Sc₂O₃ and contains Al₂O₃ and the diffusion of Mn ion from the cathode into the electrolyte is suppressed by reacting with Al₂O₃ in the intergranular boundary in the electrolyte. The fuel cells are prepd. by applying a Ni **cermet** anode material to 1 side of an Al₂O₃ contg. scandia stabilized ZrO₂ electrolyte plate, applying a La Sr manganate cathode material to the other side of the electrolyte, and sintering.

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- ST **fuel cell** alumina scandia zirconia electrolyte;
cathode manganese diffusion prevention **fuel cell**
- IT **Fuel-cell** electrolytes
(alumina in scandia **stabilized zirconia** electrolyte
for preventing diffusion of manganese ion from cathodes in fuel cells)
- IT Fuel cells
(solid-state, alumina in scandia **stabilized zirconia**
electrolyte for preventing diffusion of manganese ion from cathodes in
fuel cells)
- IT 1314-23-4, **Zirconia**, uses 1344-28-1, Alumina, uses
12060-08-1, Scandia 111569-09-6, Scandium zirconium oxide
120605-82-5, Lanthanum manganese strontium oxide (La_{0.85}MnSr_{0.15}O₃)
RL: DEV (Device component use); PEP (Physical, engineering or chemical
process); PROC (Process); USES (Uses)
(alumina in scandia **stabilized zirconia** electrolyte
for preventing diffusion of manganese ion from cathodes in fuel cells)
- IT 7439-96-5, Manganese, miscellaneous
RL: MSC (Miscellaneous)
(alumina in scandia **stabilized zirconia** electrolyte
for preventing diffusion of manganese ion from cathodes in fuel cells)

L12 ANSWER 24 OF 40 CAPLUS COPYRIGHT 2003 ACS on STN

ACCESSION NUMBER: 1996:580178 CAPLUS

DOCUMENT NUMBER: 125:252928

TITLE: Manufacture of lateral tubular solid electrolyte fuel
cells

INVENTOR(S): Takatsuki, Seiji; Kudome, Osao; Kanzaki, Junichi;
Tsukuda, Hiroshi; Hashimoto, Tsutomu

PATENT ASSIGNEE(S): Mitsubishi Heavy Ind Ltd, Japan

SOURCE: Jpn. Kokai Tokkyo Koho, 7 pp.

CODEN: JKXXAF

DOCUMENT TYPE: Patent

LANGUAGE: Japanese

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
JP 08185882	A2	19960716	JP 1994-326990	19941228
PRIORITY APPLN. INFO.:			JP 1994-326990	19941228
AB The fuel cells are prep'd. by a slurry coating-sintering method, where an anode slurry and an electrolyte are coated on a presintered porous substrate tube, sintering the 2 layers simultaneously to form the anode and a dense electrolyte layer, and forming a cathode on the electrolyte layer by slurry coating-sintering or melt spraying. The interconnector may be prep'd. along with the anode and electrolyte layer or along with the cathode. The substrate tube is preferably CaO stabilized ZrO ₂ contg. NiO or CeO ₂ , the anode is NiO mixed with Y ₂ O ₃ stabilized ZrO ₂ or MgAl ₂ O ₄ , the cathode a perovskite oxide La _x M ₁ -xM ₁ O ₃ (M = Sr, Ca, or Ba; M ₁ = Mn or Co), and the interconnector is a perovskite oxide La _x M ₂ 1-xCrO ₃ (M ₂ = Sr, Ca, or Ba), when prep'd. by slurry coating-sintering, or a cermet of a heat resistant Ni-Al or Ni-Cr alloy and Al ₂ O ₃ when prep'd. by melt spraying.				
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may be prepd. along with the anode and electrolyte layer or along with the cathode. The substrate tube is preferably CaO stabilized ZrO₂ contg. NiO or CeO₂, the anode is NiO mixed with Y₂O₃ stabilized ZrO₂ or MgAl₂O₄, the cathode a perovskite oxide La_xM₁-xM₁O₃ (M = Sr, Ca, or Ba; M₁ = Mn or Co), and the interconnector is a perovskite oxide La_xM₂-xCrO₃ (M₂ = Sr, Ca, or Ba), when prepd. by slurry coating-sintering, or a **cermet** of a heat resistant Ni-Al or Ni-Cr alloy and Al₂O₃ when prepd. by melt spraying.

ST solid electrolyte **fuel cell**; lateral tubular **fuel cell** manuf

IT 12013-47-7, Calcium zirconium oxide
RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(manuf. of lateral tubular solid electrolyte fuel cells with calcium **stabilized zirconia** substrate tubes contg. nickel oxide and ceria)

IT 111176-40-0
RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(manuf. of lateral tubular solid electrolyte fuel cells with nickel-aluminum-alumina **cermet** interconnectors)

IT 1306-38-3, Ceria, uses
RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(manuf. of lateral tubular solid electrolyte fuel cells with substrate tubes contg. nickel oxide)

L12 ANSWER 25 OF 40 CAPLUS COPYRIGHT 2003 ACS on STN

ACCESSION NUMBER: 1996:372452 CAPLUS

DOCUMENT NUMBER: 125:173175

TITLE: Electrochemical thin films fabricated by an ambient plasma technique

AUTHOR(S): Williams, J. A. A.; Vuong, K. D.; Wu, V.; Schuesselbauer, E.; Wang, X. W.

CORPORATE SOURCE: Alfred University, Alfred, NY, 14802, USA

SOURCE: Ceramic Transactions (1996), 65(Role of Ceramics in Advanced Electrochemical Systems), 373-380
CODEN: CETREW; ISSN: 1042-1122

PUBLISHER: American Ceramic Society

DOCUMENT TYPE: Journal

LANGUAGE: English

AB Results on electrochem. thin films fabricated by a radio-frequency plasma technique in an atm. environment are presented. This technique is a modified plasma spray process. Materials include yttria-**stabilized zirconia** (YSZ) and ceria for solid-oxide **fuel cell** (SOFC) electrolytes, NiO-YSZ **cermet** (SOFC anode), lanthanum strontium manganite (SOFC cathode), transparent conductive ITO for a variety of uses, manganese oxide and cobalt oxide for use in optical filters. Film d., thickness, and crystallite size can be controlled by altering deposition parameters to obtain films of different characteristics. This is advantageous to **fuel cell** fabrication where a dense electrolyte and porous electrodes are required. The obtained films were characterized by SEM, x-ray diffraction, EDS, SIMS, laser surface profiling, optical transmission-reflection, Moessbauer spectrometry, and at. force microscopy.

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characteristics. This is advantageous to **fuel cell** fabrication where a dense electrolyte and porous electrodes are required. The obtained films were characterized by SEM, x-ray diffraction, EDS, SIMS, laser surface profiling, optical transmission-reflection, Moessbauer spectrometry, and at. force microscopy.

ST electrochem thin film manuf ambient plasma; yttria **stabilized zirconia** electrolyte manuf plasma; ceria **stabilized** yttria electrolyte manuf plasma; **fuel cell** yttria **stabilized zirconia cermet** anode; lanthanum strontium manganite cathode manuf plasma; ITO film manuf ambient plasma; manganese oxide optical filter manuf plasma; cobalt oxide optical filter manuf plasma

IT 143107-06-6

RL: PEP (Physical, engineering or chemical process); PROC (Process) (**cermet**; thin films fabricated by ambient plasma technique for solid-oxide **fuel cell** anode)

IT 59707-46-9, Lanthanum manganese strontium oxide

RL: PEP (Physical, engineering or chemical process); PROC (Process) (thin films fabricated by ambient plasma technique for solid-oxide **fuel cell** cathode)

IT 51184-16-8, Cerium yttrium oxide 64417-98-7, Yttrium zirconium oxide

RL: PEP (Physical, engineering or chemical process); PROC (Process) (thin films fabricated by ambient plasma technique for solid-oxide **fuel cell** electrolyte)

IT 1306-38-3, Ceria, processes 1314-23-4, **Zirconia**, processes

RL: PEP (Physical, engineering or chemical process); PROC (Process) (yttria-**stabilized**; thin films fabricated by ambient plasma technique for solid-oxide **fuel cell** electrolyte)

IT 1314-36-9, Yttria, processes

RL: PEP (Physical, engineering or chemical process); PROC (Process) (**zirconia stabilized** by; thin films fabricated by ambient plasma technique for solid-oxide **fuel cell** electrolyte)

L12 ANSWER 26 OF 40 CAPLUS COPYRIGHT 2003 ACS on STN

ACCESSION NUMBER: 1996:288356 CAPLUS

DOCUMENT NUMBER: 124:321569

TITLE: Unit cells for solid electrolyte fuel cells

INVENTOR(S): Nakanishi, Naoya; Kadowaki, Seiten; Kawamura, Hiroyuki; Taniguchi, Shunsuke; Yasuo, Koji; Akyama, Yukinori; Saito, Toshihiko

PATENT ASSIGNEE(S): Sanyo Denki Kk, Japan

SOURCE: Jpn. Kokai Tokyo Koho, 7 pp.

CODEN: JKXXAF

DOCUMENT TYPE: Patent

LANGUAGE: Japanese

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
JP 08050899	A2	19960220	JP 1995-78992	19950404

PRIORITY APPLN. INFO.: JP 1994-117171 19940530

AB The cells use fuel anodes composed of a metal, a ceramic, and a braze for wetting the metal and ceramic at the working temp. of the cells. The metal may be Ni; the ceramic may be ZrO₂ stabilized with CaO, MgO, Y₂O₃, or Sc₂O₃, (CeO₂)_{0.8}X_{0.2} (X = Sm₂O₃, Y₂O₃, La₂O₃), PrO_x (0 < x .ltoreq.3), or BaCe_{1-x}M_xO_{3-x} (0 < x .ltoreq.0.3; M = Dy, Gd, Y, Sn, Yb, and/or Nd); and the braze may be Ti-Ni alloy, Ti-Mo alloy, Ti-Ni alloy, Ti-Ni-Mo alloy, Ti-Mo-Nb alloy, or Ni-Mo-Nb alloy having expansion coeff. 4-14 .times. 10⁻⁶.K⁻¹, preferably 10.3-13.3 .times. 10⁻⁶.K⁻¹.

ST nickel zirconia yttria anode **fuel cell**; braze wetting

agent **fuel cell** anode; solid electrolyte **fuel cell** anode

IT Cermets

(braze wetting agent for Ni contg. **cermet** anodes in solid electrolyte fuel cells)

IT Solders

(brazes, braze wetting agent for Ni contg. **cermet** anodes in solid electrolyte fuel cells)

IT Anodes

(**fuel-cell**, braze wetting agent for Ni contg. **cermet** anodes in solid electrolyte fuel cells)

IT 112721-99-0P

RL: DEV (Device component use); IMF (Industrial manufacture); PREP (Preparation); USES (Uses)

(braze wetting agent for Ni contg. **cermet** anodes in solid electrolyte fuel cells)

IT 1308-87-8, Dysprosium oxide 1313-97-9, Neodymium oxide 1314-36-9, Yttria, uses 1314-37-0, Ytterbium oxide 1332-29-2, Tin oxide 12064-62-9, Gadolinium oxide 12683-48-6 37255-95-1 51401-75-3, Molybdenum, nickel, titanium 67956-52-9 176534-60-4

RL: MOA (Modifier or additive use); USES (Uses)

(braze wetting agent for Ni contg. **cermet** anodes in solid electrolyte fuel cells)

IT 53096-50-7, Barium cerium oxide 130732-40-0, Cerium samarium oxide (Ce_{0.8}Sm_{0.4}O_{2.2}) 151382-67-1, Cerium lanthanum oxide (Ce_{0.8}La_{0.4}O_{2.2}) 174643-53-9, Cerium yttrium oxide (Ce_{0.8}Y_{0.4}O_{2.2}) 174697-25-7, Praseodymium oxide (PrO_{0.3})

RL: TEM (Technical or engineered material use); USES (Uses)

(braze wetting agent for Ni contg. **cermet** anodes in solid electrolyte fuel cells)

IT 1305-78-8, Calcium oxide, uses 1309-48-4, Magnesium oxide, uses 12060-08-1, Scandium oxide

RL: MOA (Modifier or additive use); USES (Uses)

(**zirconia stabilized** with; braze wetting agent for Ni contg. **cermet** anodes in solid electrolyte fuel cells)

L12 ANSWER 27 OF 40 CAPLUS COPYRIGHT 2003 ACS on STN

ACCESSION NUMBER: 1996:34960 CAPLUS

DOCUMENT NUMBER: 124:92689

TITLE: Manufacture of anode for solid oxide fuel cells

INVENTOR(S): Matsuzaki, Yoshio

PATENT ASSIGNEE(S): Tokyo Gas Company, Ltd., Japan

SOURCE: U.S., 8 pp. Cont.-in-part of U.S. Ser. No. 900,231, abandoned.

CODEN: USXXAM

DOCUMENT TYPE: Patent

LANGUAGE: English

FAMILY ACC. NUM. COUNT: 2

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
US 5474800	A	19951212	US 1993-136213	19931012
JP 05225987	A2	19930903	JP 1991-313543	19911101
JP 3215468	B2	20011009		

PRIORITY APPLN. INFO.: JP 1991-176235 A 19910620
JP 1991-313543 A 19911101
US 1992-900231 B2 19920617

AB A dispersion of Ni particles which form the anode is ensured, coherence of the Ni or NiO particles when being annealed or when generating electricity is prevented, the adhesion of the anode to the solid electrolyte layer is good, the contact resistance is reduced, and the anode performance is improved. To form an anode on 1 surface of the central solid electrolyte layer, Ni or NiO and a soln. of an organometallic complex salt in an org.

solvent, from which is obtained thin films or minute particles of a solid electrolyte by thermal decompn., are blended, and the solvent is evapd. until a suitable viscosity is obtained. The slurry obtained in this manner is coated on the central solid electrolyte layer and this coated film is dried, annealed, and thermally decompd. to obtain a NiO-solid electrolyte or a Ni-solid electrolyte **cermet**.

AB A dispersion of Ni particles which form the anode is ensured, coherence of the Ni or NiO particles when being annealed or when generating electricity is prevented, the adhesion of the anode to the solid electrolyte layer is good, the contact resistance is reduced, and the anode performance is improved. To form an anode on 1 surface of the central solid electrolyte layer, Ni or NiO and a soln. of an organometallic complex salt in an org. solvent, from which is obtained thin films or minute particles of a solid electrolyte by thermal decompn., are blended, and the solvent is evapd. until a suitable viscosity is obtained. The slurry obtained in this manner is coated on the central solid electrolyte layer and this coated film is dried, annealed, and thermally decompd. to obtain a NiO-solid electrolyte or a Ni-solid electrolyte **cermet**.

ST nickel oxide electrolyte anode **fuel cell**

IT Anodes

(**fuel-cell**, manuf. of nickel or nickel oxide and **stabilized zirconia**)

IT 1314-23-4P, **Zirconia**, uses

RL: DEV (Device component use); PNU (Preparation, unclassified); PREP (Preparation); USES (Uses)

(manuf. of solid oxide **fuel-cell** anode of nickel or nickel oxide and **stabilized**)

IT **1306-38-3**, Ceria, uses 1314-36-9, Yttria, uses

RL: MOA (Modifier or additive use); USES (Uses)

(manuf. of solid oxide **fuel-cell** anode of nickel or nickel oxide and **zirconia stabilized** with)

IT 1313-99-1, Nickel oxide (NiO), uses 7440-02-0, Nickel, uses

RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)

(manuf. of solid oxide **fuel-cell** anode of **stabilized zirconia** electrolyte and)

L12 ANSWER 28 OF 40 CAPLUS COPYRIGHT 2003 ACS on STN

ACCESSION NUMBER: 1995:417682 CAPLUS

DOCUMENT NUMBER: 122:192513

TITLE: Nickel-scandia **stabilized zirconia cermet** anodes for solid oxide fuel cells

INVENTOR(S): Mizutani, Yasunobu; Tamura, Moryoshi

PATENT ASSIGNEE(S): Toho Gas Kk, Japan

SOURCE: Jpn. Kokai Tokkyo Koho, 9 pp.

CODEN: JKXXAF

DOCUMENT TYPE: Patent

LANGUAGE: Japanese

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
JP 07006768	A2	19950110	JP 1993-171207	19930617
JP 3351865	B2	20021203		

PRIORITY APPLN. INFO.: JP 1993-171207 19930617

AB The anodes are composed of a **cermet** contg. Ni and Sc2O3 stabilized ZrO2. These anodes have high elec. cond. and low polarization.

TI Nickel-scandia **stabilized zirconia cermet** anodes for solid oxide fuel cells

AB The anodes are composed of a **cermet** contg. Ni and Sc2O3 stabilized ZrO2. These anodes have high elec. cond. and low polarization.

ST **fuel cell** anode nickel **zirconia**; scandia **stabilized zirconia** nickel anode; **cermet**

zirconia nickel anode

IT Electric conductivity and conduction
(elec. cond. of **cermet** anodes contg. nickel and scandium oxide **stabilized zirconia**)

IT Anodes
(**fuel-cell**, **cermet** anodes contg. nickel and scandium oxide **stabilized zirconia** for solid electrolyte fuel cells)

IT 1314-23-4, **Zirconia**, uses 7440-02-0, Nickel, uses 157979-54-9, Scandium zirconium oxide (Sc0.22Zr0.89O2.11)
RL: DEV (Device component use); USES (Uses)
(**cermet** anodes contg. nickel and scandium oxide **stabilized zirconia** for solid electrolyte fuel cells)

IT 12060-08-1, Scandia
RL: DEV (Device component use); MOA (Modifier or additive use); USES (Uses)
(**cermet** anodes contg. nickel and scandium oxide **stabilized zirconia** for solid electrolyte fuel cells)

IT 161849-15-6
RL: DEV (Device component use); PRP (Properties); TEM (Technical or engineered material use); USES (Uses)
(**cermet** anodes contg. nickel and scandium oxide **stabilized zirconia** for solid electrolyte fuel cells)

L12 ANSWER 29 OF 40 CAPLUS COPYRIGHT 2003 ACS on STN

ACCESSION NUMBER: 1994:275414 CAPLUS
DOCUMENT NUMBER: 120:275414
TITLE: Solid electrolyte fuel cells
INVENTOR(S): Okuo, Takayasu; Uchama, Futoshi; Tsukamoto, Koichi; Kaga, Yasuo; Horiuchi, Hideo; Kanazawa, Motoi
PATENT ASSIGNEE(S): Kogyo Gijutsuin, Japan; Nippon Kooteingu Kogyo Kk
SOURCE: Jpn. Kokai Tokkyo Koho, 7 pp.
CODEN: JKXXAF
DOCUMENT TYPE: Patent
LANGUAGE: Japanese
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
JP 06029024	A2	19940204	JP 1992-204220	19920709
JP 3057342	B2	20000626		

PRIORITY APPLN. INFO.: JP 1992-204220 19920709

AB The fuel cells have a Y2O3-stabilized ZrO2 (YSZ) electrolyte between a cathode and an anode, where the electrodes are porous heat resistant alloy or **cermet** selected from Ni-Cr-Al, Ni-Cr-Fe, Ni-Cr-Fe-Al, Ni-Cr-Al + YSZ, Ni-Cr-Fe + YSZ, and Ni-Cr-Fe-Al + YSZ. Another structure of the fuel cells has a substrate plate of tube composed of the above heat resistant material, and the plate of the tube may also serve an electrode. The electrolyte and the electrodes may be melt sprayed films. These fuel cells have low resistance and suppressed sepn. between the electrolyte, electrodes, and the support.

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ST solid electrolyte **fuel cell**

IT 1314-23-4, **Zirconia**, miscellaneous
RL: MSC (Miscellaneous)

(**stabilized**, electrolytes and supports from, for solid electrolyte fuel cells)

IT 64417-98-7, Yttrium zirconium oxide
 RL: USES (Uses)
 (**zirconia stabilized** with, electrolytes from, for solid electrolyte fuel cells)

IT 1314-36-9, Yttria, miscellaneous
 RL: MSC (Miscellaneous)
 (**zirconia stabilized** with, electrolytes from, for solid electrolyte fuel cells)

IT 1305-78-8, Calcia, miscellaneous **1344-28-1**, Alumina, miscellaneous
 RL: MSC (Miscellaneous)
 (**zirconia stabilized** with, substrate plates and tubes from, for solid electrolyte fuel cells)

L12 ANSWER 30 OF 40 CAPLUS COPYRIGHT 2003 ACS on STN

ACCESSION NUMBER: 1994:58570 CAPLUS
 DOCUMENT NUMBER: 120:58570
 TITLE: Manufacture of electrodes for solid-electrolyte fuel cells
 INVENTOR(S): Okumura, Kyoshi; Yamamoto, Juzo; Fukui, Takehisa; Takeuchi, Shinji; Hatsutori, Masatoshi
 PATENT ASSIGNEE(S): Fine Ceramics Center, Japan; Chubu Electric Power; Kansai Electric Power Co
 SOURCE: Jpn. Kokai Tokkyo Koho, 10 pp.
 CODEN: JKXXAF
 DOCUMENT TYPE: Patent
 LANGUAGE: Japanese
 FAMILY ACC. NUM. COUNT: 1
 PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
JP 05266892	A2	19931015	JP 1992-93516	19920318
JP 3117781	B2	20001218		

PRIORITY APPLN. INFO.: JP 1992-93516 19920318

AB The fuel anodes are manufd. by mixing aq. solns. contg. ions of Ni, Co, and/or Ru with sols contg. ZrO₂ and/or Ce oxide, then heating the mixts. to form powders. Alternatively, the fuel anodes are manufd. by mixing aq. solns. contg. ions of Ni and/or Mg with sols contg. Y₂O₃ and/or ZrO₂, then heating the mixts. to form powders. The air cathodes are manufd. by mixing aq. solns. contg. La, and Mg, Fe, Co, Ni, and/or Cr with sols contg. Zr₂O and Ce oxides, then heating the mixts. to form powders. Alternatively, the cathodes are manufd. by mixing aq. solns. contg. ion of La, Mg, and Sr and/or Ca with sols contg. Y₂O₃ and ZrO₂, then heating the mixts. to form powders.

ST nickel zirconia **cermet** battery cathode; cathode lanthanum manganese zirconium oxide; sol gel process cathode manuf; process sol gel anode manuf

IT Cermets
 (nickel-zirconia base, manuf. of, sol-gel process, for **fuel-cell** anodes)

IT Cathodes
 (**fuel-cell**, lanthanum manganese zirconium oxides, manuf. of, by sol-gel process)

IT Anodes
 (**fuel-cell**, nickel-zirconia base cermets, manuf. of, by sol-gel process)

IT **1306-38-3P**, Cerium oxide (CeO₂), uses
 RL: PREP (Preparation); USES (Uses)
 (samarium oxide-stabilized, cathodes contg., manuf. of, by sol-gel process, for fuel cells)

IT 1314-23-4P, **Zirconia**, uses

RL: PREP (Preparation); USES (Uses)

(**stabilized**, cathodes contg., manuf. of, by sol-gel process,
for fuel cells)

IT 1305-78-8P, Calcium oxide, uses 1314-36-9P, Yttria, uses

RL: PREP (Preparation); USES (Uses)

(**zirconia stabilized** with, cathodes contg., manuf.
of, by sol-gel process, for fuel cells)

L12 ANSWER 31 OF 40 CAPLUS COPYRIGHT 2003 ACS on STN

ACCESSION NUMBER: 1993:606979 CAPLUS

DOCUMENT NUMBER: 119:206979

TITLE: Ceramic materials for SOFC anode cermets

AUTHOR(S): Marques, R. M. C.; Frade, J. R.; Marques, F. M. B.

CORPORATE SOURCE: Ceram. Glass Eng. Dep., Univ. Aveiro, Aveiro, 3800,
Port.

SOURCE: Proceedings - Electrochemical Society (1993),
93-4 (Proceedings of the Third International Symposium
on Solid Oxide Fuel Cells, 1993), 513-22
CODEN: PESODO; ISSN: 0161-6374

DOCUMENT TYPE: Journal

LANGUAGE: English

AB Solid solns. based on Y2O3-stabilized ZrO2 (YSZ) doped with .ltoreq.10
mol% CeO2 or TiO2 were prep'd. and characterized as potential ceramic
constituents of anode cermets for solid-oxide fuel cells (SOFC). The
CeO2-doped materials exhibit negligible electronic cond. when subjected to
reducing conditions. The addn. of .apprx.10 mol% TiO2 to YSZ increases
the electronic cond. of YSZ under the same reducing conditions. For the
same concn. of mixed valence dopant, the addn. of TiO2 is more effective
in promoting electronic cond. under reducing conditions, which contrasts
with the smaller level of redn. achieved under such conditions, estd. from
gravimetric measurements. Electronic defects with significantly different
mobilities for the 2 dopants are formed during the redn. process. Based
on the obtained results, the TiO2-doped YSZ materials are good candidates
as anode **cermet** components for SOFC.

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mol% CeO2 or TiO2 were prep'd. and characterized as potential ceramic
constituents of anode cermets for solid-oxide fuel cells (SOFC). The
CeO2-doped materials exhibit negligible electronic cond. when subjected to
reducing conditions. The addn. of .apprx.10 mol% TiO2 to YSZ increases
the electronic cond. of YSZ under the same reducing conditions. For the
same concn. of mixed valence dopant, the addn. of TiO2 is more effective
in promoting electronic cond. under reducing conditions, which contrasts
with the smaller level of redn. achieved under such conditions, estd. from
gravimetric measurements. Electronic defects with significantly different
mobilities for the 2 dopants are formed during the redn. process. Based
on the obtained results, the TiO2-doped YSZ materials are good candidates
as anode **cermet** components for SOFC.

ST ceramic material anode **cermet fuel cell**;
solid oxide **fuel cell** anode **cermet**; yttria
stabilized zirconia ceramic anode **cermet**;
ceria doped yttria **stabilized zirconia** ceramic;
titania doped yttria **stabilized zirconia** ceramic

IT Cermets
(anodes, yttria-**stabilized zirconia** ceramics for,
ceria- or titania-doped, for fuel cells)

IT Electric conductivity and conduction
(of ceria- and titania-doped yttria-**stabilized**
zirconia ceramics, oxygen partial pressure dependence in
relation to)

IT Ceramic materials and wares
(**zirconia**, yttria-**stabilized**, ceria- or
titania-doped, for anode cermets, for fuel cells)

IT Anodes
(**fuel-cell**, cermets, yttria-**stabilized**

zirconia ceramics for, ceria- or titania-doped)

IT 1314-23-4, **Zirconia**, uses
 RL: USES (Uses)
 (yttria-stabilized, ceria- or titania-doped, ceramics, for anode cermets, for fuel cells)

IT 1306-38-3, Ceria, uses 13463-67-7, Titania, uses
 RL: USES (Uses)
 (zirconia doped with, yttria-stabilized, ceramics, for anode cermets, for fuel cells)

IT 1314-36-9, Yttria, uses
 RL: USES (Uses)
 (zirconia stabilized by, ceria- or titania-doped, ceramics, for anode cermets, for fuel cells)

L12 ANSWER 32 OF 40 CAPLUS COPYRIGHT 2003 ACS on STN
 ACCESSION NUMBER: 1993:569130 CAPLUS
 DOCUMENT NUMBER: 119:169130
 TITLE: Activities of rare-earth-containing oxides as electrodes for oxide ion conductor
 AUTHOR(S): Eguchi, Koichi; Inoue, Takanori; Setoguchi, Toshihiko; Arai, Hiromichi
 CORPORATE SOURCE: Grad. Sch. Eng. Sci., Kyushu Univ., Kasuga, 816, Japan
 SOURCE: Journal of Alloys and Compounds (1993), 193(1-2), 59-61
 CODEN: JALCEU; ISSN: 0925-8388
 DOCUMENT TYPE: Journal
 LANGUAGE: English

AB The substitutional dissoln. of an appropriate dopant to CeO₂ is effective in controlling ionic and elec. conductivities. The combination of La_{0.6}Sr_{0.4}Co_{0.98}Ni_{0.02}O₃ electrode/(CeO₂)_{0.8}(SmO_{1.5})_{0.2} electrolyte exhibited high electrode polarization cond. Anodic properties were evaluated in relation to an electrolyte material and oxide material in an Ni-based **cermet** anode.

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ST rare earth contg oxide electrode cond; lanthanum nickel strontium cobaltate electrode cond; cerium samarium oxide electrolyte cond; nickel **cermet** based anode cond; **fuel cell** electrolyte

IT **Fuel-cell** electrolytes
 (rare earth-contg. oxides)

IT Anodes
 (**fuel-cell**, nickel-base)

IT 1314-36-9, Yttrium oxide (Y₂O₃), properties
 RL: PRP (Properties)
 (electrolyte from **zirconia stabilized** with, with cobalt lanthanum nickel strontium oxide or lanthanum manganese strontium oxide electrodes, elec. cond. in relation to)

IT 1306-38-3, Cerium dioxide, properties
 RL: PRP (Properties)
 (electrolyte, samarium oxide-doped, with cobalt lanthanum nickel strontium oxide electrode, elec. cond. in relation to)

IT 1314-23-4, **Zirconia**, properties
 RL: PRP (Properties)
 (electrolyte, yttria-stabilized, with cobalt lanthanum strontium nickel oxide or lanthanum manganese strontium oxide electrodes, elec. cond. in relation to)

L12 ANSWER 33 OF 40 CAPLUS COPYRIGHT 2003 ACS on STN
 ACCESSION NUMBER: 1993:499829 CAPLUS
 DOCUMENT NUMBER: 119:99829

TITLE: Sputter-deposited medium-temperature solid oxide fuel cells with multi-layer electrolytes
AUTHOR(S): Wang, L. S.; Barnett, S. A.
CORPORATE SOURCE: Department of Materials Science and Engineering, Northwestern University, Evanston, IL, 60208, USA
SOURCE: Solid State Ionics (1993), 61(4), 273-6
CODEN: SSIOD3; ISSN: 0167-2738

DOCUMENT TYPE: Journal

LANGUAGE: English

AB The deposition, interfacial impedance, and characteristics of solid oxide fuel cells (SOFC) with thin-film multi-layer electrolytes are described. Layers of 1 μm thick Ag-YSZ (Y₂O₃-stabilized ZrO₂) **cermet** cathode, 15-20 μm thick electrolyte, and a 1-2.5 μm thick Ni-YSZ anode were deposited on porous Al₂O₃ by reactive magnetron co-sputtering of metal targets in Ar-O mixts. The effect of adding Y-stabilized Bi₂O₃ (YSB) and Y-doped CeO₂ (YDC) layers at the YSZ electrolyte surfaces was investigated. The open circuit voltage of the H/H₂O (3%), Ni-YSZ/electrolyte/Ag-YSZ, air fuel cells tested at 750.degree. was 0.78-0.85 V, less than expected theor., indicating some porosity in the electrolyte layers. The cell resistance was 4.5 $\Omega\cdot\text{cm}^2$ for a YSZ electrolyte, due mainly to the electrode interfacial resistance, and the max. power d. was 35 mW/cm². Adding a 60 nm-thick YSB layer at the YSZ/Ag-YSZ interface reduced the air electrode resistance from .apprxeq.1.4 to 0.45 $\Omega\cdot\text{cm}^2$, leading to an increase in the max. power d. to .apprxeq.50 mW/cm². Adding a 100 nm-thick YDC layer at the Ni-YSZ/YSZ interface further increased the max. power d. to 110 mW/cm² at a cell resistance of 1.6 $\Omega\cdot\text{cm}^2$. The three-layer YSB/YSZ/YDC electrolyte thus resulted in a factor-of-three increase in power d. over a YSZ electrolyte.

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ST solid oxide **fuel cell** multilayer electrolyte

IT **Fuel-cell** electrolytes

(yttria-stabilized zirconia, sputter deposited thin-film multilayer, performance of)

IT 1304-76-3, Bismuth oxide (Bi₂O₃), uses 1306-38-3, Cerium dioxide, uses 1314-23-4, Zirconia, uses

RL: USES (Uses)

(yttria-stabilized, electrolyte, multi-layer, sputter-deposited medium-temp. solid oxide fuel cells with)

IT 1314-36-9, Yttria, uses

RL: USES (Uses)

(zirconia stabilized with, electrolyte, multi-layer, sputter-deposited medium-temp. solid oxide fuel cells with)

ACCESSION NUMBER: 1993:499810 CAPLUS
 DOCUMENT NUMBER: 119:99810
 TITLE: Role of electrode interfacial resistances in the characteristics of sputter-deposited medium-temperature solid oxide fuel cells
 AUTHOR(S): Wang, L. S.; Barnett, S. A.
 CORPORATE SOURCE: Dep. Mater. Sci. Eng., Northwestern Univ., Evanston, IL, 60208, USA
 SOURCE: Proceedings - Electrochemical Society (1993), 93-4(Proceedings of the Third International Symposium on Solid Oxide Fuel Cells, 1993), 649-55
 CODEN: PESODO; ISSN: 0161-6374
 DOCUMENT TYPE: Journal
 LANGUAGE: English

AB The deposition, structure, interfacial impedance, and characteristics of solid oxide fuel cells (SOFC) with thin-film Y2O3-stabilized ZrO2 (YSZ) electrolytes are described. The cell layers, 1 .mu.m Ag-YSZ **cermet** cathode, 15-20 .mu.m electrolyte, and a 1-2.5 .mu.m Ni-YSZ anode were deposited on porous Al2O3 by reactive magnetron co-sputtering of metal targets in Ar-O mixts. In some cases, Y-stabilized Bi2O3 (YSB) and Y-doped CeO2 (YDC) layers were added at the electrolyte surfaces. The open circuit voltage of H/H2O (3%), Ni-YSZ/electrolyte/Ag-YSZ, air fuel cells tested at 750.degree. was 0.78-0.85 V, less than expected theor., indicating porosity in the YSZ layers. The cell resistance was 4.5 .OMEGA.-cm2 for a YSZ electrolyte, due mainly to the electrode interfacial resistance and the max. power d. was 35 mW/cm2. Adding a 60-nm-thick YSB layer at the YSZ/Ag-YSZ interface reduced the air electrode resistance from .apprxeq.1.4 to 0.45 .OMEGA.-cm2, leading to an increase in the max. power d. to .apprxeq.50 mW/cm2. Adding a 100-nm-thick YDC layer at the YSZ/Ni-YSZ interface further increased the max. power d. to 110 mW/cm2 at a cell resistance of 1.6 .OMEGA.-cm2. The three-layer YSB/YSZ/YDC electrolyte thus resulted in a factor-of-three increase in power d. over a YSZ electrolyte.

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ST solid oxide **fuel cell** deposition structure; sputter deposited solid oxide **fuel cell**; interfacial resistance solid oxide **fuel cell**

IT **Fuel-cell** electrolytes
 (yttria-tabilized bismuth oxide and yttria-stabilized **zirconia** and yttria-stabilized ceria, sputter-deposited)

IT Sputtering
 (reactive, solid oxide **fuel cell** fabrication by)

IT 149145-60-8, Silver, **zirconia**
 RL: USES (Uses)

(cathodes of yttria-stabilized, sputter-deposited medium-temp. solid oxide fuel cells with, characteristics of)

IT 1304-76-3, Bismuth oxide (Bi₂O₃), properties 1306-38-3, Cerium dioxide, properties
 RL: PRP (Properties)
 (yttria-stabilized, electrolyte surface with layer of, sputter-deposited fuel cells with)

IT 1314-23-4, Zirconia, uses
 RL: USES (Uses)
 (yttria-stabilized, electrolyte, sputter-deposited medium-temp. solid oxide fuel cells with, characteristics of)

IT 1314-36-9, Yttria, uses
 RL: USES (Uses)
 (zirconia stabilized with, electrolyte, sputter-deposited medium-temp. solid oxide fuel cells with, characteristics of)

L12 ANSWER 35 OF 40 CAPLUS COPYRIGHT 2003 ACS on STN

ACCESSION NUMBER: 1993:476257 CAPLUS

DOCUMENT NUMBER: 119:76257

TITLE: An investigation of anode material and anodic reaction for solid oxide **fuel cell**

AUTHOR(S): Eguchi, Koichi; Setoguchi, Toshihiko; Okamoto, Kotaro; Arai, Hiromichi

CORPORATE SOURCE: Grad. Sch. Eng. Sci., Kyushu Univ., Kasuga, 816, Japan

SOURCE: Proceedings - Electrochemical Society (1993), 93-4 (Proceedings of the Third International Symposium on Solid Oxide Fuel Cells, 1993), 494-503
 CODEN: PESODO; ISSN: 0161-6374

DOCUMENT TYPE: Journal

LANGUAGE: English

AB Anodic characteristics were investigated for Ni and Pt anodes. The anodic reaction on Ni is strongly affected by partial pressure of O (pO₂) but not by the kind of fuel. The polarization cond. for Pt was sensitive to fuel and pO₂, and significantly deteriorated in the presence of CO-CO₂ mixt. as compared with H-H₂O. The anodic polarization was also influenced by the oxide component in the **cermet**, as well as the metal. The effect of oxide component can be explained by activity for redox reaction and elec. cond.

TI An investigation of anode material and anodic reaction for solid oxide **fuel cell**

AB Anodic characteristics were investigated for Ni and Pt anodes. The anodic reaction on Ni is strongly affected by partial pressure of O (pO₂) but not by the kind of fuel. The polarization cond. for Pt was sensitive to fuel and pO₂, and significantly deteriorated in the presence of CO-CO₂ mixt. as compared with H-H₂O. The anodic polarization was also influenced by the oxide component in the **cermet**, as well as the metal. The effect of oxide component can be explained by activity for redox reaction and elec. cond.

ST anode characteristic solid oxide **fuel cell**; nickel **cermet** anode characteristic; platinum anode characteristic **fuel cell**

IT Anodes
 (fuel-cell, nickel **cermet** and platinum, characterization of)

IT 66594-54-5 148936-33-8 148936-79-2

RL: USES (Uses)

(anodes, polarization cond. of, elec. properties of oxide components in relation to)

IT 108916-21-8, Lanthanum manganese strontium oxide (La_{0.6}MnSr_{0.4}O₃)

RL: USES (Uses)

(cathodes, fuel cells contg., nickel **cermet** and platinum anodes in, characterization of)

IT 64417-98-7, Yttrium zirconium oxide

RL: USES (Uses)
(electrolyte, fuel cells contg., nickel **cermet** and platinum
anodes in, characterization of)

IT 1314-23-4, **Zirconia**, uses

RL: USES (Uses)
(yttria-**stabilized**, electrolyte, fuel cells contg., nickel
cermet and platinum anodes in, characterization of)

IT 1314-36-9, Yttria, uses

RL: USES (Uses)
(**zirconia stabilized** by, electrolyte, fuel cells
contg., nickel **cermet** and platinum anodes in,
characterization of)

L12 ANSWER 36 OF 40 CAPLUS COPYRIGHT 2003 ACS on STN

ACCESSION NUMBER: 1992:637143 CAPLUS

DOCUMENT NUMBER: 117:237143

TITLE: Effects of anode material and fuel on anodic reaction
of solid oxide fuel cells

AUTHOR(S): Setoguchi, Toshihiko; Okamoto, Kotaro; Eguchi, Koichi;
Arai, Hiromichi

CORPORATE SOURCE: Grad. Sch. Eng. Sci., Kyushu Univ., Kasuga, 816, Japan

SOURCE: Journal of the Electrochemical Society (1992),
139(10), 2875-80

CODEN: JESOAN; ISSN: 0013-4651

DOCUMENT TYPE: Journal

LANGUAGE: English

AB Anodic properties of solid oxide fuel cells have been evaluated for
several anode/electrolyte systems. Anodic overvoltage of
metal/Y2O3-stabilized ZrO2 (YSZ) interface was related with metal-O
bonding strength and was the smallest for the Ni anode. The anodic
polarization cond. of Ni-YSZ **cermet**/YSZ electrolyte interface
strongly depended on O partial pressure in fuel, but was independent of
the kind of fuel (H-H2O, CO-CO2, and CH4-H2O). The activation of O ion is
the rate limiting step in the overall reaction. The overvoltages of Ni/
and Pt/Sm2O3-doped CeO2 (SDC) were very small as compared with those of
Ni/ and Pt/YSZ. The anodic properties were also influenced by the oxide
material mixed with Ni as a **cermet** component. The sequence of
anodic polarization conductivities of Ni-oxide **cermet** systems
was Ni-PrOx > Ni-SDC > Ni-YSZ.

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the rate limiting step in the overall reaction. The overvoltages of Ni/
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material mixed with Ni as a **cermet** component. The sequence of
anodic polarization conductivities of Ni-oxide **cermet** systems
was Ni-PrOx > Ni-SDC > Ni-YSZ.

ST anode reaction solid oxide **fuel cell**

IT Fuel cells

(nickel-yttria-**stabilized zirconia**/yttria-
stabilized zirconia/lanthanum strontium manganese
oxide, performance of)

IT Anodes

(**fuel-cell**, metal oxide-**cermet** systems,
properties of)

IT Electrolytic polarization

(interfacial, of nickel-yttria-**stabilized zirconia**
anode/yttria-**stabilized zirconia** electrolyte
interface in **fuel cell**)

IT 7439-89-6, Iron, properties 7439-96-5, Manganese, properties
 7440-02-0, Nickel, properties 7440-05-3, Palladium, properties
 7440-06-4, Platinum, properties 7440-16-6, Rhodium, properties
 7440-18-8, Ruthenium, properties 7440-48-4, Cobalt, properties
 7440-57-5, Gold, properties
 RL: PRP (Properties)
 (anodic properties of, **fuel cell** use in relation
 to)

IT 74-82-8, Methane, reactions
 RL: RCT (Reactant); RACT (Reactant or reagent)
 (reforming of, with steam, over nickel-yttria-stabilized
zirconia cermet, for **fuel cell**)

IT 1306-38-3, Ceria, properties
 RL: PRP (Properties)
 (samaria-doped, nickel composite with, anodic properties of)

IT 1314-23-4, **Zirconia**, uses
 RL: USES (Uses)
 (yttria-stabilized, nickel composite with, anodic properties
 of, **fuel cell** use in relation to)

IT 1314-36-9, Yttria, uses
 RL: USES (Uses)
 (**zirconia stabilized** with, nickel composite with,
 anodic properties of, **fuel cell** use in relation to)

L12 ANSWER 37 OF 40 CAPLUS COPYRIGHT 2003 ACS on STN

ACCESSION NUMBER: 1992:575082 CAPLUS
 DOCUMENT NUMBER: 117:175082
 TITLE: Anode materials for solid-oxide fuel cells
 INVENTOR(S): Sawada, Akihiro; Tsuneyoshi, Kikuji
 PATENT ASSIGNEE(S): Mitsubishi Heavy Industries, Ltd., Japan
 SOURCE: Jpn. Kokai Tokkyo Koho, 8 pp.
 CODEN: JKXXAF
 DOCUMENT TYPE: Patent
 LANGUAGE: Japanese
 FAMILY ACC. NUM. COUNT: 1
 PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
JP 04121964	A2	19920422	JP 1990-238999	19900911
JP 2891528	B2	19990517		

PRIORITY APPLN. INFO.: JP 1990-238999 19900911

AB The materials are Ni-CeO₂ cermets xNi.(1-x)CeO₂ (x = 20-40 wt.%), and may contain (Y₂O₃-stabilized) ZrO₂. The anodes have low reforming-related overpotential.

ST **fuel cell** anode **cermet**; nickel ceria
fuel cell anode; zirconia yttria ceria nickel anode

IT Anodes
 (**fuel-cell**, nickel-ceria and nickel-ceria-(yttria-stabilized) **zirconia**)

IT 143683-35-6 143683-36-7 143683-37-8
 143683-38-9 143683-39-0 143776-78-7
 143776-79-8 143776-80-1 143776-81-2
 143776-82-3 143776-83-4 143776-84-5
 143776-85-6 143776-86-7 143776-87-8
 143776-88-9
 RL: USES (Uses)
 (anodes, for solid-electrolyte fuel cells)

L12 ANSWER 38 OF 40 CAPLUS COPYRIGHT 2003 ACS on STN

ACCESSION NUMBER: 1991:167880 CAPLUS
 DOCUMENT NUMBER: 114:167880
 TITLE: High-temperature **fuel cell** for
fuel-cell stacks

INVENTOR(S): Ivers-Tiffée, Ellen; Wersing, Wolfram
PATENT ASSIGNEE(S): Siemens A.-G., Germany
SOURCE: Ger. Offen., 7 pp.
CODEN: GWXXBX
DOCUMENT TYPE: Patent
LANGUAGE: German
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
DE 3922673	A1	19910124	DE 1989-3922673	19890710
DE 3922673	C2	19930617		

PRIORITY APPLN. INFO.: DE 1989-3922673 19890710

AB The (H-O) cell has (Y₂O₃-stabilized ZrO₂) solid electrolyte foil, which is coated on each side with 1 electrode. The cells are gas-tightly sepd. by elec. conductive bipolar metal separator plates. The plates have gas channels. The electrodes are built of several sublayers of varying materials to provide a continuous transition between the thermal expansion coeff. of the electrolyte foil and the bipolar plate and to prevent mech. stresses or failure during the **fuel-cell** operation.

The anode is ZrO₂-Ni or CeO₂-ZrO₂-Ni **cermet** with increasing Ni concn. to the separator plate. The cathode is LaMnO₃ whose La is replaced to varying extent with heavy alk. earth metals.

TI High-temperature **fuel cell** for **fuel-cell** stacks

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The anode is ZrO₂-Ni or CeO₂-ZrO₂-Ni **cermet** with increasing Ni concn. to the separator plate. The cathode is LaMnO₃ whose La is replaced to varying extent with heavy alk. earth metals.

ST **fuel cell** zirconia nickel anode; ceria zirconia nickel **cermet** anode; nickel zirconia ceria **cermet** anode; **cermet fuel cell** anode; cathode lanthanum manganate **fuel cell**

IT Fuel cells

(stacks, hydrogen/oxygen, with yttria **stabilized zirconia** electrolyte)

IT 55267-07-7, Nickel, zirconium 133195-72-9

RL: USES (Uses)

(anodes, for **fuel-cell** stacks with yttria-**stabilized zirconia** electrolyte)

IT 108916-09-2, Cobalt lanthanum strontium oxide (CoLa_{0.8}Sr_{0.2}O₃)

108916-22-9, Lanthanum manganese strontium oxide (La_{0.8}MnSr_{0.2}O₃)

133340-05-3

RL: USES (Uses)

(cathodes, for **fuel-cell** stacks with yttria-**stabilized zirconia** electrolyte)

L12 ANSWER 39 OF 40 CAPLUS COPYRIGHT 2003 ACS on STN

ACCESSION NUMBER: 1990:409389 CAPLUS

DOCUMENT NUMBER: 113:9389

TITLE: A new solid oxide **fuel cell** design based on thin film electrolytes

AUTHOR(S): Barnett, S. A.

CORPORATE SOURCE: Dep. Mater. Sci. Eng., Northwestern Univ., Evanston, IL, 60208, USA

SOURCE: Energy (Oxford, United Kingdom) (1990), 15(1), 1-9
CODEN: ENEYDS; ISSN: 0360-5442

DOCUMENT TYPE: Journal
LANGUAGE: English

AB A novel solid oxide **fuel cell** (SOFC) design that can be fabricated entirely using low-temp., thin-film processing is described. The crit. design feature is the use of thin (.apprx.50 nm), catalytically active oxide layers on a <10 .mu.m thick Y2O3-stabilized ZrO2 supported electrolyte to minimize reaction overpotentials and ohmic losses. Doped CeO2 at the fuel electrode side and doped Bi oxide at the O electrode side are proposed for the surface layers. The surface reaction rates and overall electrolyte conductance in this design are high enough at <750.degree. to allow efficient SOFC operation. The operating temp. is low enough that low-resistance, thin-film metal electrodes, Ni at the fuel side and Ag at the O side, can be used to provide low ohmic losses. The overpotential behavior of the proposed cell was estd. from literature data and leads to fuel efficiency >50% at a power d. of .apprx.0.5 W/cm2 when operated at 750.degree..

TI A new solid oxide **fuel cell** design based on thin film electrolytes

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ST **fuel cell** thin film electrolyte

IT 112721-99-0

RL: USES (Uses)

(anodes, **fuel cell** design based on thin-film electrolyte and)

IT 1304-76-3, Bismuth oxide (Bi2O3), uses and miscellaneous

RL: USES (Uses)

(barium-stabilized, **fuel cell** design based on thin-film electrolyte and layer of)

IT 7440-39-3, Barium, uses and miscellaneous

RL: USES (Uses)

(bismuth oxide stabilized with, **fuel cell** design based on thin-film electrolyte and layer of)

IT 127637-84-7, Silver, yttria, zirconia

RL: USES (Uses)

(cathodes of **cermet**, **fuel cell** design based on thin-film electrolyte and)

IT 7440-54-2, Gadolinium, uses and miscellaneous

RL: USES (Uses)

(ceria doped with, **fuel cell** design based on thin-film electrolyte and layer of)

IT 1306-38-3, Ceria, uses and miscellaneous

RL: USES (Uses)

(gadolinium-doped, **fuel cell** design based on thin-film electrolyte and layer of)

IT 1314-23-4, Zirconia, uses and miscellaneous

RL: USES (Uses)

(yttria-stabilized, thin-film electrolytes, **fuel cell** design based on)

IT 1314-36-9, Yttria, uses and miscellaneous

RL: USES (Uses)

(zirconia stabilized with, thin-film electrolytes,

fuel cell design based on)

L12 ANSWER 40 OF 40 CAPLUS COPYRIGHT 2003 ACS on STN

ACCESSION NUMBER: 1988:78662 CAPLUS
DOCUMENT NUMBER: 108:78662
TITLE: Sulfur-tolerant composite **cermet** electrodes
for solid oxide electrochemical cells
INVENTOR(S): Isenberg, Arnold O.
PATENT ASSIGNEE(S): Westinghouse Electric Corp., USA
SOURCE: U.S., 9 pp.
CODEN: USXXAM
DOCUMENT TYPE: Patent
LANGUAGE: English
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
US 4702971	A	19871027	US 1986-867860	19860528
EP 253459	A2	19880120	EP 1987-300648	19870126
EP 253459	A3	19881214		
EP 253459	B1	19930512		
R: BE, DE, FR, GB, IT, SE				
CA 1291788	A1	19911105	CA 1987-528139	19870126
JP 62281271	A2	19871207	JP 1987-65539	19870318
JP 2779445	B2	19980723		
US 4812329	A	19890314	US 1987-72834	19870713
			US 1986-867860	19860528

PRIORITY APPLN. INFO.:

AB A **fuel cell** has an anode bonded to the exterior of a tubular, solid, O₂-conducting electrolyte which is also in contact with an interior cathode, and the anode comprises particles of an electronic conductor contacting the electrolyte, with a ceramic-metal oxide coating partially surrounding the particles and bonded to the electrolyte, and a coating of an ionic-electronic conductive material attached to the ceramic-metal oxide coating and to the exposed portions of the particles. Thus, a tubular **fuel cell** was prep'd. by using a 2-mm-thick porous CaO-stabilized ZrO₂ support tube with a 1-mm-thick 40% porous air cathode of doped La manganite on top of the support tube, and a 50-.mu. (ZrO₂)_{0.90}(Y₂O₃)_{0.10} electrolyte on the cathode. A 100-.mu. 50% porous layer of .apprx.5-.mu. Ni powder was deposited over the electrolyte by slurry dipping and a 1-5-.mu. skeleton of Y₂O₃-stabilized ZrO₂ was deposited around the Ni powder layer to form a ZrO₂-reinforced Ni **cermet** anode. The anode was impregnated with a satd. soln. of nitrates of Ce and La, which decompd. into (CeO₂)_{0.8}(La₂O₃)_{0.2} when heated. When operated at 900 and 1000.degree. using a H-3% H₂O fuel, this cell had higher output voltage than a cell using an non-impregnated anode. The structure of the anode of the invention can also be used for electrodes in solid-state electrolyzers and gas sensors.

TI Sulfur-tolerant composite **cermet** electrodes for solid oxide electrochemical cells

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cermet anode. The anode was impregnated with a satd. soln. of nitrates of Ce and La, which decompd. into $(\text{CeO}_2)_{0.8}(\text{La}_2\text{O}_3)_{0.2}$ when heated. When operated at 900 and 1000.degree. using a H-3% H₂O fuel, this cell had higher output voltage than a cell using an non-impregnated anode. The structure of the anode of the invention can also be used for electrodes in solid-state electrolyzers and gas sensors.

ST **fuel cell cermet** anode; nickel zirconia
ceria lanthania electrode

IT Electrodes

(yttria-stabilized zirconia-nickel, impregnated
with lanthanum-doped ceria, for solid-state electrolyzers and gas
sensors)

IT Anodes

(**fuel-cell**, yttria-stabilized
zirconia-nickel, impregnated with lanthanum-doped ceria)

IT 7439-91-0, Lanthanum, uses and miscellaneous

RL: USES (Uses)

(ceria doped with, anodes impregnated with, yttria-stabilized
zirconia-nickel, for fuel cells)

IT 1306-38-3, Ceria, uses and miscellaneous

RL: USES (Uses)

(lanthanum-doped, anodes impregnated with, yttria-stabilized
zirconia-nickel, for fuel cells)